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This Week in The IRON AGE

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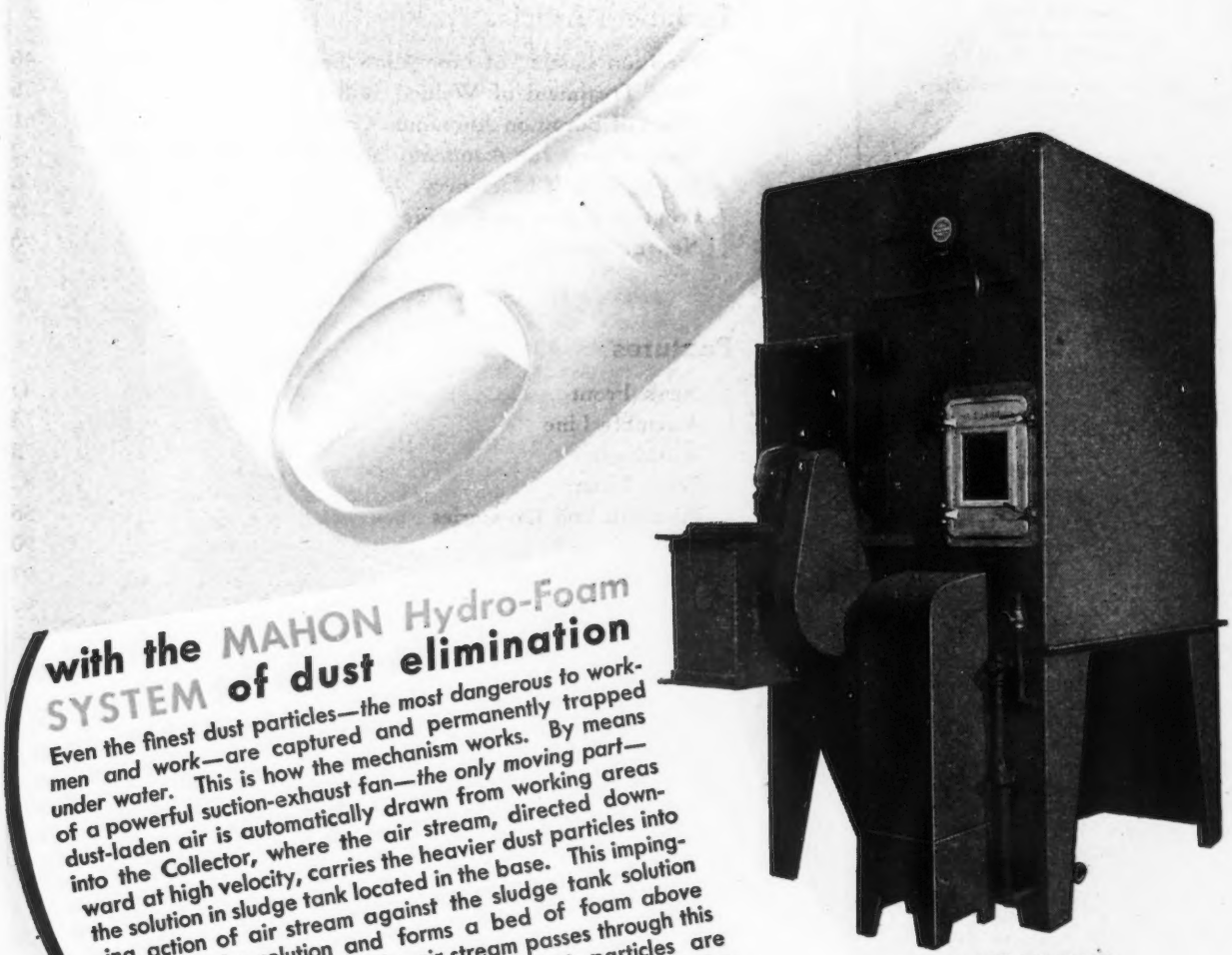
DUST... *insidious enemy of workmen and work...*
PERMANENTLY PUT OUT OF CIRCULATION... *under water*



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The IRON AGE

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"Something New Has Been Added"

AMERICANS like new things whether they be an added ingredient in a cigarette or a shiny motor car of latest model. New books, new motion pictures, new clothes of latest fashion and new faces catch the fancy of the inhabitants of this country and keep wheels turning and factories busy. That is, of course, when they can be had, which in normal times is in prolific abundance if one has the wherewithal to buy them.

Industry has been affected by this style consciousness even though its products are functional rather than fashionable. Thousands of people, for example, in prewar days would not keep an automobile that was more than a year old, regardless of its operating ability. Today nobody owns a passenger car that hasn't celebrated at least its third birthday.

Even in more prosaic products not used to impress one's neighbors and where function-ability is the primary requirement, the style concept has crept into the picture. Railroads boast of streamlining and even machine tools undergo facelifting at the hands of industrial artists who make a good living adding glamour to gears and eye appeal to iron.

We have learned to do without this quite a bit while industry has been so busy making products for Hitler and Hirohito. Function-ability has been the watchword, and machine shop managers have been not only contented but happy to get equipment with but one coat of paint.

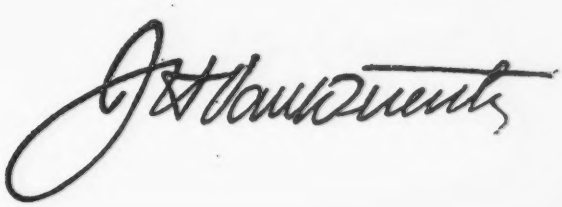
What effect will this have on the postwar making and selling of industrial products?

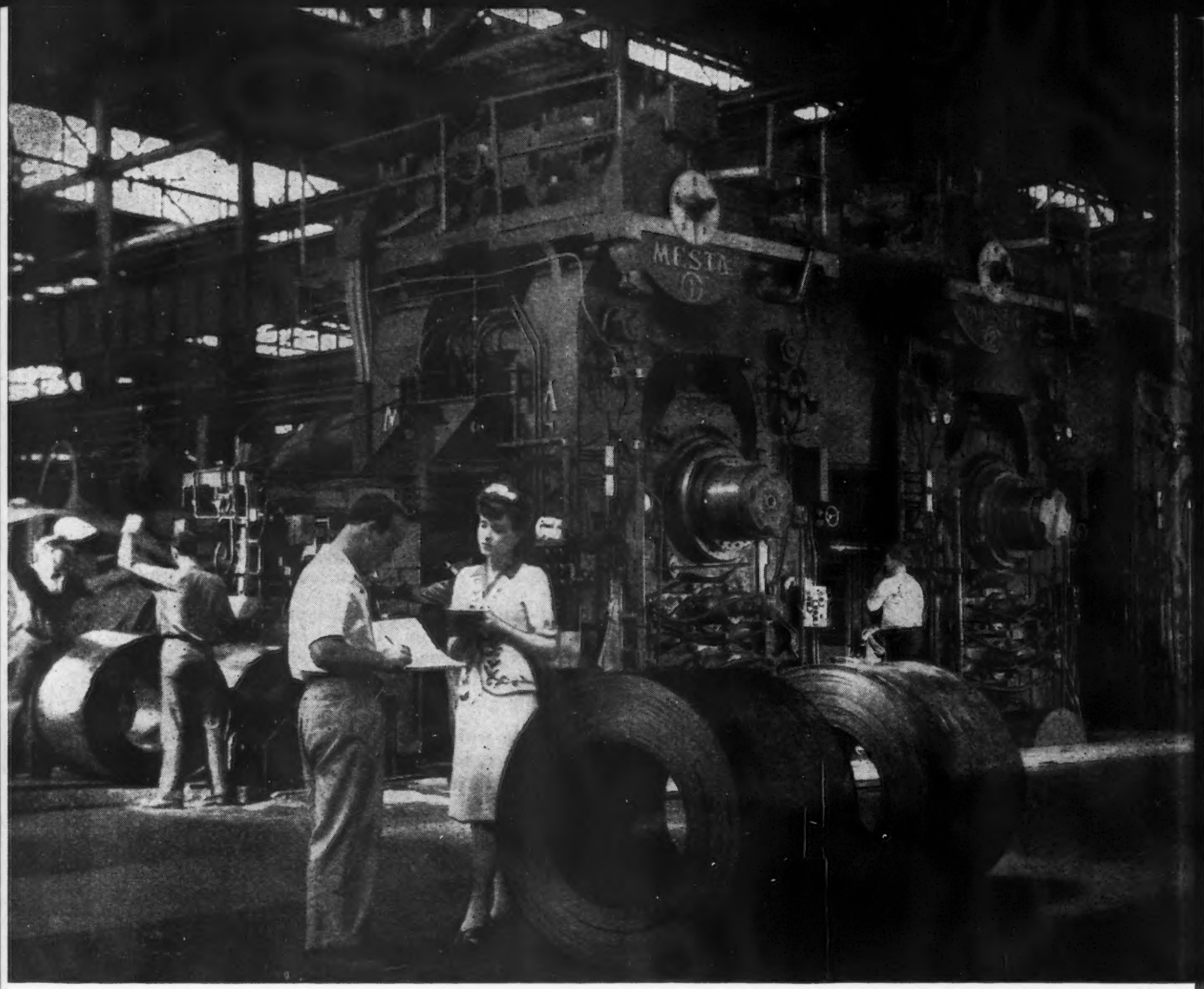
So far as those which go to the consumer are concerned, I think this question is fully answered by the current advertising in our popular journals. Visions of not-now-to-be-had consumer products of tomorrow—refrigerators, radios, appliances of all sorts and even family autogyros—peer from these pages to whet the appetite of future customers.

But what about industrial products whose chief function is to earn money on their investment? I think that this quesion too can be readily answered. And by the statement that normally no one loves children more than their parents. I think that it hurts the maker more than the user to see a fine intricate mechanism of precision leaving the factory with a dull and unattractive finish regardless of its ability to make good return on its investment. It is as unappropriate as it would be to put a seventeen-jeweled watch movement in a galvanized iron case.

Of course function-ability will always be the chief requirement of capital goods equipment and here the slogan will be "Something better has been added." But the maker will see to it from pride of paternity that the eye appeal comes back.

We of THE IRON AGE have been forced to put serviceability ahead of style in producing this informational tool of war but you can bet your bottom dollar that it will put on a new suit of clothes as soon as the stores are open again. And I think this same thing goes for all makers of industrial products.





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The IRON AGE
June 19, 1945

NEWS FRONT

► In the year since the introduction of investment casting at Watervliet Arsenal, approximately 40,000 parts of various designs have been precision cast to near completion. These have varied in weight from less than 1 oz. to ¾ lb. and have been cast of a variety of the common heat treatable steels such as SAE analyses 1015, 3415, 4180, 4340, 4640, 6150 and 1095.

The most important application of the process at Watervliet is its use for producing parts of a design which ordinarily would require a series of machining operations.

The Arsenal has found that investment casting does not offer competitive advantages for large quantities of parts that can be made on one or two setups using automatic machinery, or forged or stamped to size, or made satisfactorily by powder metallurgical methods. Only when the number of such parts is small, however, the reduced cost of tooling required for precision casting makes its use most economical.

► Boron additions to an aluminum permanent mold casting alloy serves to refine grain structure and modify microporosity from the sharp shrink type to the rounded gas type of cavity. Boron in aluminum reduces mechanical properties of the casting, increases brittleness but does not affect corrosion resistance or heat treatment characteristics of the alloy.

► The first attempt to modify a gear hobber for cemented carbide hobs has offered some promising results. Spindle speed was increased to 215 rev. per min. by gear ratio changes of the hob spindle gear and pinion and two near gears in the speed change gear box.

► Incoming scrap from Europe is only a dribble of the potential supply. April shipments amounted to 16,470 tons and in May rose to 22,213 tons. The first 10 days of June saw 1338 tons shipped.

► A staff for liquidation of Army-Navy surplus has arrived in Europe for advance work for disposal in the ETO; it will be responsible for all surplus material in that theatre.

► Following warnings during the winter car emergency and months old predictions of redeployment equipment shortages, the freight car industry was last week placed on the production urgency list by the WPB. Also included in the move were the railroad brake shoe industry and the chilled car wheel industry.

► WPB does not estimate how much aluminum is freed by this open-ending order, merely stating that large quantities are immediately available. Orders for extrusions must still be rated, according to the order.

Office furniture builders such as General Fireproofing, Youngstown, are planning immediate production of aluminum furniture.

► A new line of 190 to 250 hp. diesel motors announced by Joshua Hendy Iron Works will feature a return to cast iron from the all welded steel design which was built to withstand battle shock.

► Among most advanced of Army Engineer's studies for extension of Columbia River power development is the plan for construction of a dam 51 miles downstream from Grand Coulee at Foster Creek. A 225 ft. high dam is contemplated to develop 600,000 to 800,000 kw. of power.

Bonneville Power Administration claims to justify its existence by accumulating a net surplus of $14,500,000 on an annual gross amounting to $23,000,000.

► The military vehicle program, originally projected at a rate of 625,000 units, is currently being cut to about 400,000. By the end of the first half of the year approximately 300,000 of these will have been built.

The largest cutback in this program sent out so far was the $100,000,000 Studebaker contract for 2½ ton trucks on lend-lease for Russia. This cut affected 5,000 workers and 429 subcontractors.

The above truck cutbacks improve the overall truck picture for civilian use. Of the 233,472 units thus far allocated for production in 1945, Chevrolet's 62,312 is the largest.

▲▲ Eastern Stainless Steel Corp., Baltimore, and Industrial Steels, Inc., Cambridge, Mass., will likely be merged when a proxy vote is taken July 19.

Precision Casting Of Low Alloy Steels

. . . Watervliet Arsenal uses investment casting process as a valuable supplement to conventional machining methods for producing small mechanism parts for cannon of carbon and low alloy steels. The author includes cost and dimensional tolerance data on specific components, together with metallurgical and mechanical properties.

o o o

By CAPTAIN LESTER W. GOTT
Assistant Works Manager,
Watervliet Arsenal, Watervliet, N. Y.

o o o

ONE of many technological advances resulting from the wartime drive for improved manufacturing methods, the recent improvement and increased industrial application of the "investment" or "lost wax" process for producing precision castings has occasioned widespread interest among manufacturers. Long used in the dental and jewelry fields for casting metallic dentures and intricate jewelry shapes, this production technique received new consideration as a manufacturing tool when urgent requirements developed at the start of the present war for turbine and supercharger parts made of highly refractory alloys difficult to forge or machine.

The successful utilization of the process for casting to size these parts has been reported as effecting tremendous savings and making possible high speed production of advanced design war materiel. Its use for casting tool steel into complicated tool shapes requiring only minor operations for completion has been described. Papers written on the process develop the feature that new designs unrestricted by established machining practices can be economically precision cast, and reports are available on its successful application to the mass production of intricately designed nonferrous parts for ordnance equipment such as direction finders, small motors, and radar equipment.

It is the purpose of the present article to report factually on the highly successful use of the process for economically producing small precision mechanism parts of the common carbon and low alloy steels. Where small and medium quantities are required of small steel parts ordinarily requiring extensive tooling and considerable machining time, the use of investment castings accomplishes substantial reductions in manufacturing costs.

As the principal producer of many types of Army cannon, Watervliet Arsenal is charged with the manufacture of a great variety of breech mechanism parts. A wide selection of parts is needed for assembly in weapons being currently produced, while many orders are received each month for maintenance and replacement parts required for types of cannon no longer in production but being used all over the world. Small quantities of parts of new design are often required on extremely short notice, in order that the development and proof test of new design cannon can be completed as promptly as possible. Orders may call for less than one hundred or sometimes for many thousand parts.

For approximately a year, the Arsenal has used the investment casting process to considerable advantage in coping with manufacturing problems developing from these ever changing requirements for many types of cannon parts. During this period approximately 40,000 parts of numerous designs have been precision cast to near completion and sent from the foundry to the machining and heat-treat divisions for finishing. These have varied in weight from less than 1 oz. to ¾ lb., and have been cast of a variety of the common heat treatable steels such as SAE analyses 1015, 3415, 4130, 4340, 4640, 6150 and 1095. Suitable heat treatment has developed strength and hardness properties comparable to those obtained from barstock or forgings of similar chemical composition. Maintenance of dimensions within tolerances of plus or minus 0.002 in. for each linear inch has been customary, and surface smoothness of the as-cast pieces has been such that only critical wear surfaces have required bench filing or polishing. Fine detail such as small lugs, undercuts, fillets and piece marking in small size letters is reproduced faithfully. Fig. 1 shows an assortment of investment castings in the as-cast condition typical of the variety of parts produced in the Arsenal foundry.

The most important application of the process at Watervliet is its use for producing parts of a design which ordinarily would require a series of machining operations such as milling, slotting, shaping or profiling—each of which often requires special tools, fixtures and set-ups. Direct labor charges on much of this type of work are substantially reduced by precision casting and for work of new design, tooling costs are usually cut to a small fraction of the costs for tools needed for manufacture by conventional machining methods.

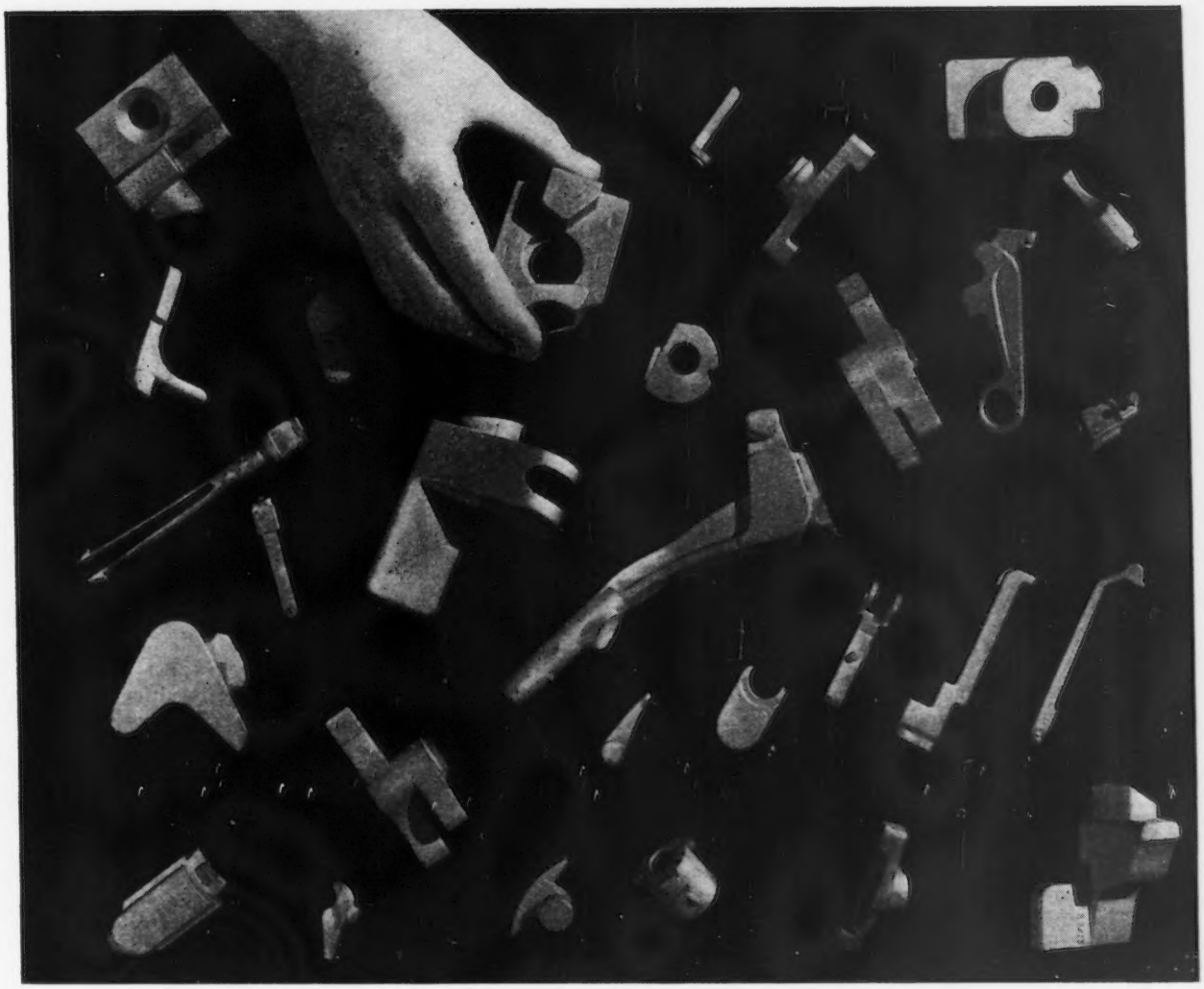


FIG. 1—Assortment of carbon and low alloy steel parts precision cast at Watervliet Arsenal.

Investment casting does not offer competitive advantages for large quantities of parts which can be made on one or two setups using automatic machinery, or forged or stamped to size, or made satisfactorily by powder metallurgical processes. Should the number of such parts be small, however, the reduced cost of tooling required in connection with precision casting often makes this approach most economical.

Occasionally, parts weighing over ½ lb. and of a new and complicated design held to higher precision than obtainable from the investment casting process are required without delay. The complicated shape of some of these parts renders production from bar stock time consuming and costly, while the manufacture of forging dies and procurement of drop forgings, perhaps indicated as the most economical method for large quantity production, can not be accomplished in the time available. Working from master patterns machined within a few days in the toolroom, on the other hand, it is possible to quickly supply the production machine shops with precision castings requiring only light cuts for completion.

The technique followed in precision casting steel mechanism parts is basically the same as has been used in the dental and jewelry field for many years, except that use is made of recently developed highly refractory investment materials. Certain minor refinements directed at improving precision and reducing manufacturing costs have also been found beneficial for the class of work handled at Watervliet Arsenal. The process as described below has been found most efficient for producing mechanism parts where the quantities required of each design component have varied from less than one hundred up to several thousand.

The first step is the making of a precision smooth-surfaced master pattern by conventional machining methods. In addition to the usual allowance for metal shrinkage, the dimensions of the master pattern must provide for wax pattern shrinkage and expansion occurring in the refractory molds used later in the process. When the part to be cast is small, dimensional changes are often so slight that an existing machined part can be used as the master pattern.

A bismuth alloy mold of two or more sections is then formed around this master pattern with suitable regard for required drafts. Wax patterns are produced in these molds employing vacuum-pressure injection devices which accomplish the evacuation of the mold cavity and then the pressure injection of liquid wax. Injection times, wax temperatures, and wax compositions are carefully controlled to insure dimensional precision in the patterns. When size and shape characteristics of a part are favorable and the quantity required is large, the manufacture of two or more master patterns and subsequent form-

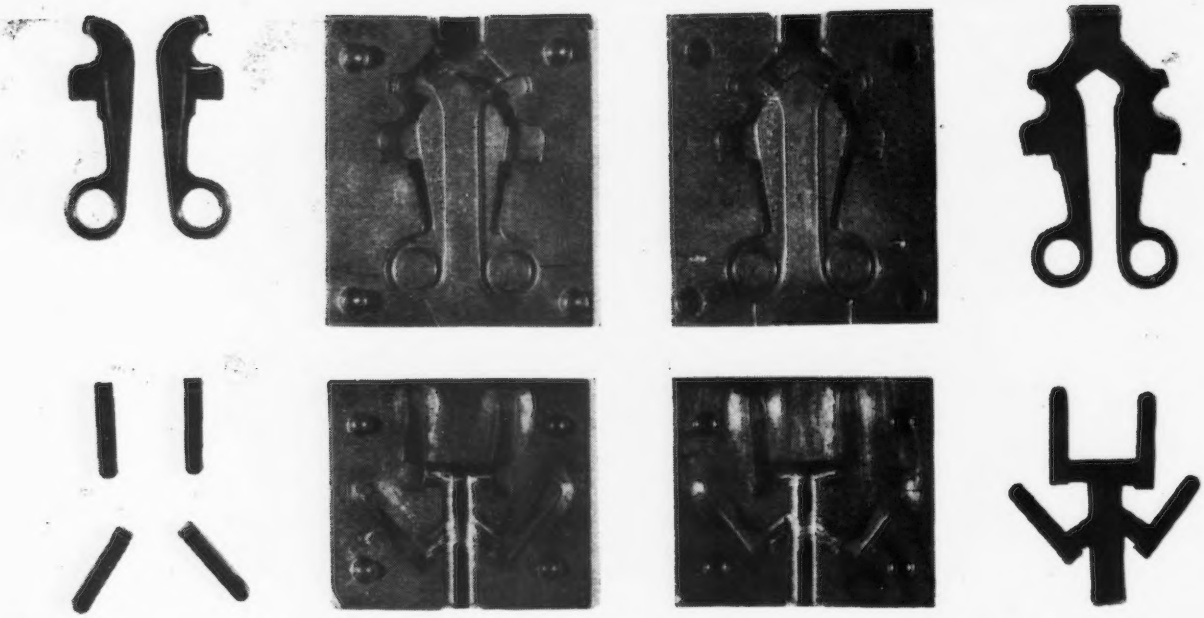


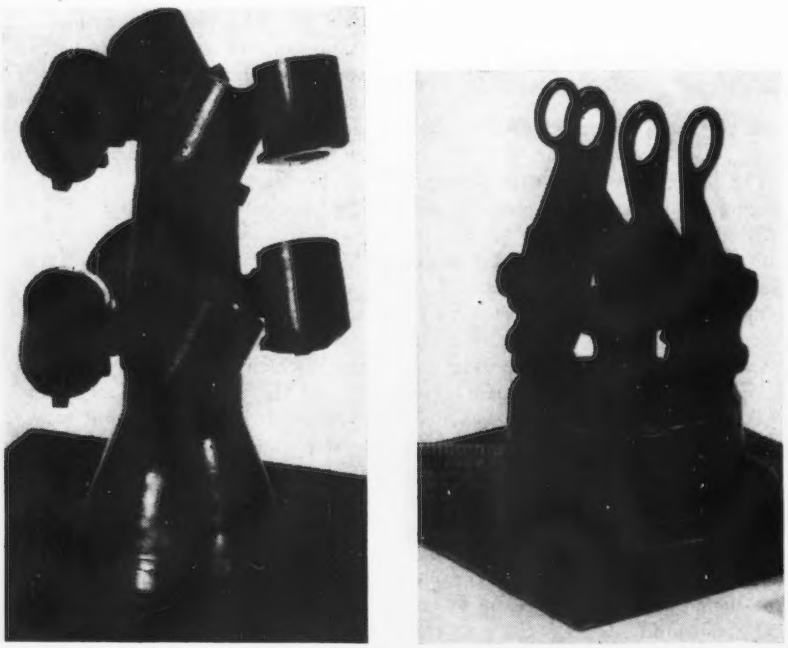
FIG. 2—(Left) Metal master patterns (Middle) wax injection molds of bismuth alloy and (Right) resulting wax patterns for two typical components for breech block mechanism.

ing of bismuth alloy molds with two or more cavities can be accomplished. Cavities and injection gate are so located in these molds that mounting of the wax patterns into casting formation can be accomplished from a single sprue rather than requiring individual mounting. Fig. 2 shows several master patterns, resulting bismuth alloy molds, and wax patterns as removed from these molds.

Using small electric soldering pencils to soften the wax, the patterns are then assembled into casting formations so designed as to give good static casting characteristics together with the necessary economy of materials. The most common arrangement for casting larger pieces is to mount them from a shallow plug, while smaller pieces are usually mounted around a taller tapered shaft (Fig. 3). The cavities resulting when these mounting shapes are later eliminated from the refractory molds serve as combination gates and feeding heads. The apparently excessive size of these "heads" is deliberately planned inasmuch as these parts are statically cast, and the large feeding heads must supply adequate pressure and sufficient molten metal for insuring soundness in each casting.

o o o

FIG. 3—Patterns assembled in casting formation. To minimize wax consumption, patterns are jointed to wax-covered aluminum mounting shapes which are withdrawn from the investment molds after several hours in the wax-elimination oven operating at 200 deg. F. (See also Fig. 5.)



The completed wax pattern assemblies are then given an initial coating of an extremely fine and highly refractory material. Upon the later elimination of the pattern assembly from the investment mold, this fine texture material serves as the facing of the mold cavities and imparts the necessary smooth finish and sharp detail to the cast parts. After this coating has dried, 12 gage black iron cylinders or flasks are slipped over the pattern assemblies and waxed to the bottom plates on which the mounting shapes are fastened. The investing slurry is then poured into the flasks which are vibrated until solid refractory material packs firmly into place around the precoated patterns and fills the flasks. The molds are then set aside until chemical action accomplishes the necessary bonding and setting-up of the investment.

Molds Baked

The molds are next transferred to an oven at 200 deg. F. where the bulk of the wax is melted out leaving a cavity the shape of the original pattern assembly. Then they are trans-

ferred to an electric bake-out oven coasting at a temperature in the vicinity of 700 deg. F. and are brought up to a red heat—usually 1400 deg. F.—within 3 hr. Maintaining the molds at this temperature for several hours in an oxidizing atmosphere results in the elimination of all wax residue and volatile matter from the refractory molds. They are then completely cured and in condition to receive the metal.

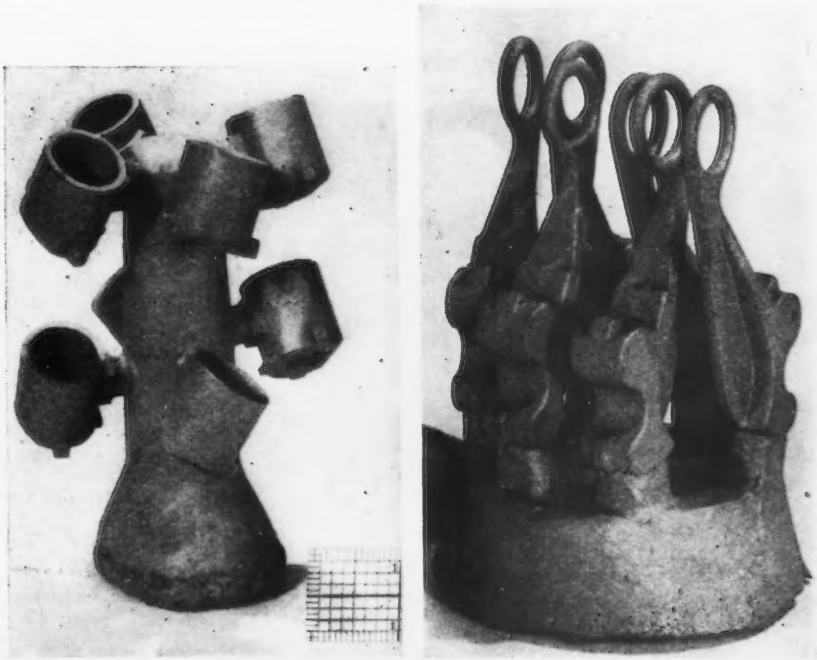
Steel heats average 15 to 20 lb. and are melted to required analysis in small electric induction melting furnaces powered by a 20 kw. high frequency spark gap converter. The usual charge is about 60 per cent gate and feeding head scrap from previous heats and about 40 per cent purchased bar stock, all of known analysis. When required, certain alloy additions to adjust the chemical composition of the metal are made on melt down. Just before casting, melting losses are replaced and final deoxidation of the melt is accomplished by additions of ferromanganese, ferrosilicon and aluminum. Pouring temperatures are in the 2900-2975 deg. F. range. Each heat is usually sufficient for pouring between six and ten molds. The furnace operator picks up the small furnace, Fig. 4, which weighs only about 50 lb., fully charged, while another removes the required number of molds from the bake-out ovens. As fast as the molds can be set down in the pouring station, the operator pours them full of metal and the combination pouring gates and feeding heads are immediately covered with an insulating material to keep them open to atmospheric pressure.

FIG. 4—Six to ten molds are gravity poured from each heat of steel melted in a small induction furnace.

Gravity Pouring

The use of ordinary gravity pouring in conjunction with the production of precision cast ferrous parts by the "lost wax" process is believed unique to Watervliet Arsenal and is considered to offer certain advantages over the common centrifugal and pressure casting techniques when producing parts of a design easy to feed and of sufficiently heavy section to cast without the aid of artificially applied casting forces. The special equipment necessary for centrifugal or pressure casting is not required for gravity pouring. Further, it is common practice when pressure or centrifugally casting investment molds to melt only enough metal per heat to cast a single mold, or if the casting equipment is elaborate, up to three or four molds. Gravity casting permits the pouring of any number of molds up to the capacity of the melting furnace. Melting larger size heats and fewer heats reduces the time spent on weighing charges and alloy additions, and makes possible better control of chemical analysis and pouring temperatures. It is extremely difficult to estimate pouring temperatures for very small heats of steel, and any short delay due to mechanical difficulty with pressure or centrifugal

FIG. 5—Clusters of sand blasted castings prior to cut-off and inspection. All feeding head scrap is remelted. (See also Fig. 3.)



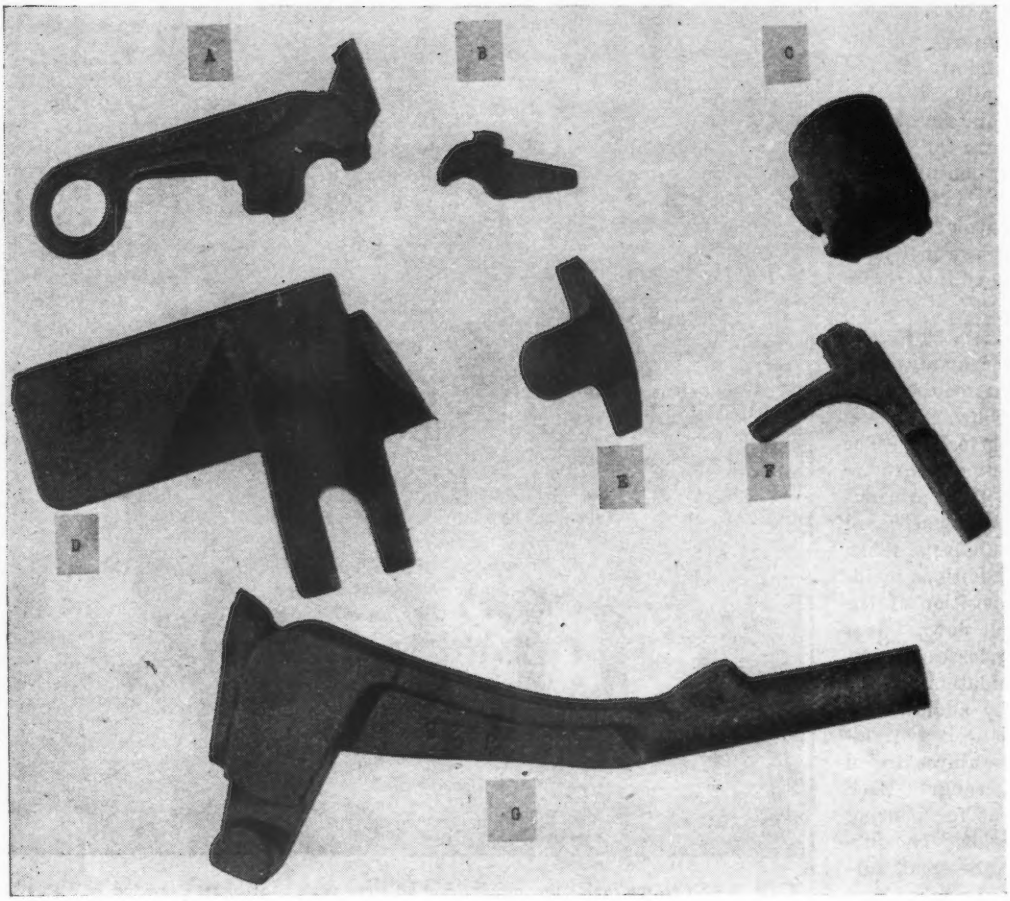


FIG. 6—Assortment of precision castings produced in connection with the manufacture of a new design firing mechanism. Parts A, B and C are detailed in Figs. 7, 8 and 9. Cost data are given in Tables I and II.

casting equipment can easily result in overheated and off-analysis steel.

After the metal has solidified and cooled, the castings are shaken out and sand blasted. Fig. 5 shows clusters of sand blasted castings corresponding to the patterns shown in Fig. 3. Use of fine sand for blasting gives a surface finish approximating in smoothness that of a regular machine finish. The castings are cut off using high speed abrasive wheels and, after preliminary visual inspection and dimensional check, are given heat treatment designed to refine the coarse as-cast grain structure and make the material suitable for machining. They are then transferred to the machine shops for necessary finishing work and later are returned for heat treatment to required physi-

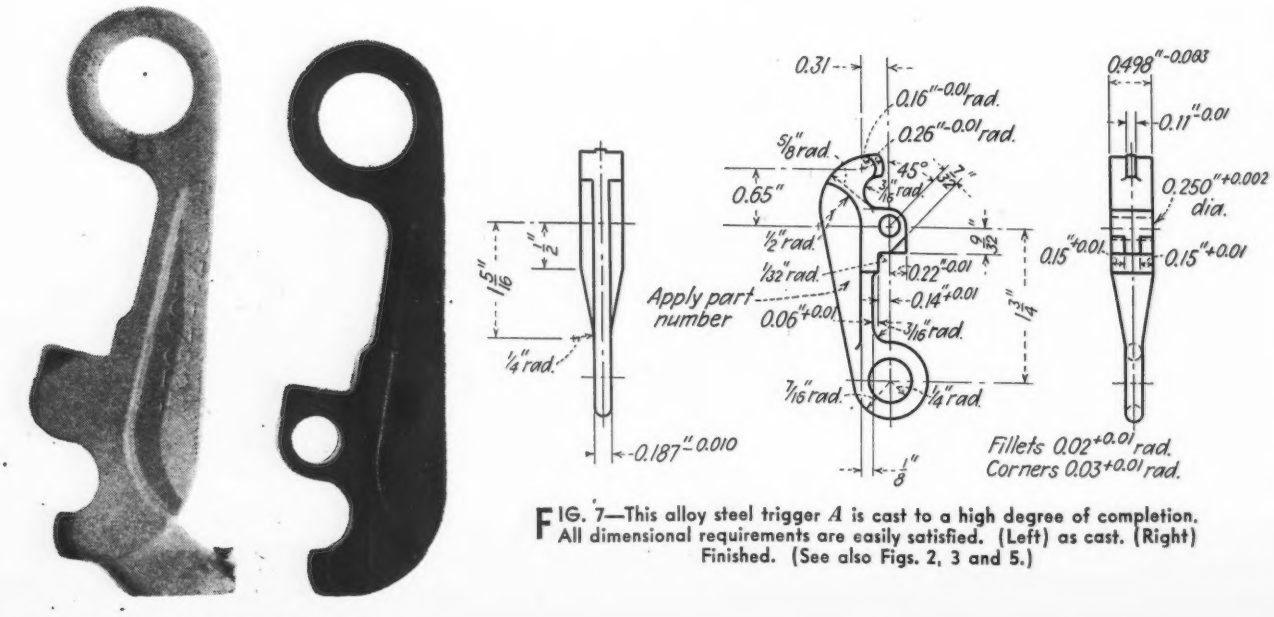


FIG. 7—This alloy steel trigger *A* is cast to a high degree of completion. All dimensional requirements are easily satisfied. (Left) as cast. (Right) Finished. (See also Figs. 2, 3 and 5.)

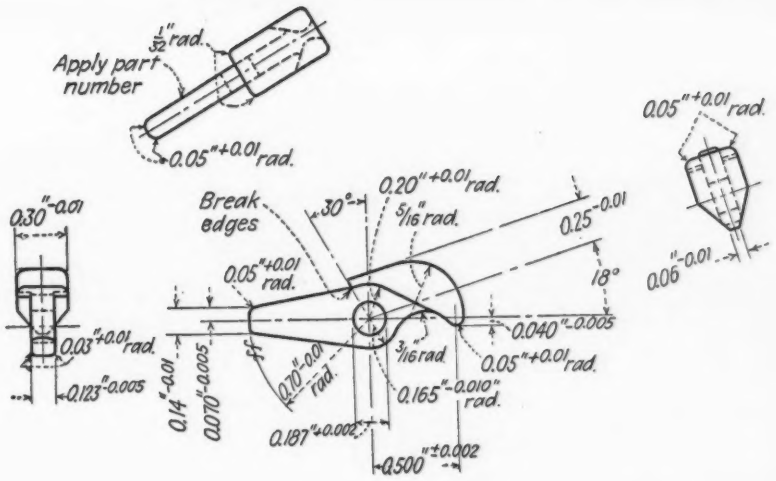


FIG. 8—This alloy steel tripper *B* is well designed for precision casting. High precision is easily maintained in casting small components. It is heat treated to a hardness of Rockwell C 50-55.

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cal properties. This may include case carburizing, skin recovery for decarburized surfaces, hardening and tempering operations. Finally, parts are treated for protection against corrosion and given final inspection including a complete dimensional check. Certain parts receive 100 per cent X-ray inspection while others are X-rayed on a percentage basis to insure the maintenance of required quality.

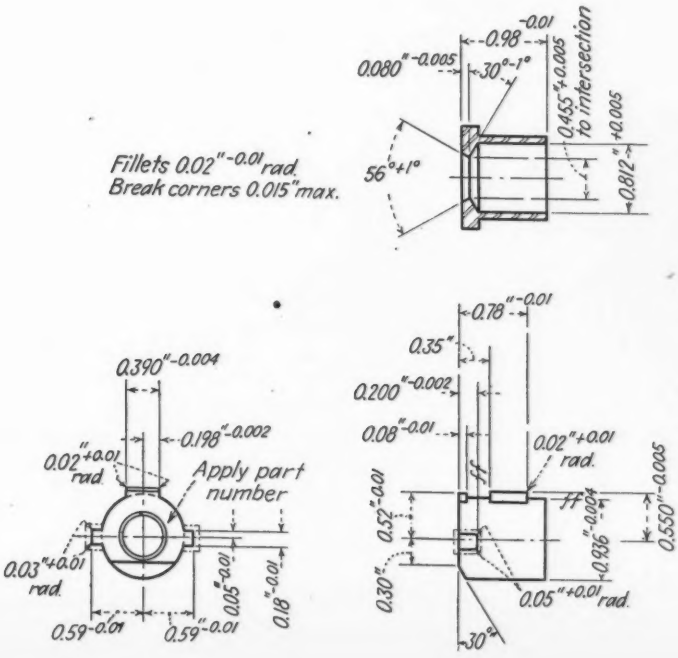
Production Economies

Reductions in manufacturing costs resulting from the use of precision castings are particularly impressive where the single casting operation replaces a series of machining operations and effectively reduces the cost of tooling required. Some of the advantageous applications of the investment casting process are described in the following paragraphs. Attention is called to dimensional precision required and attained.

Recently orders were received to manufacture several thousand newly designed firing mechanisms together with a variety of parts required to adapt these mechanisms to several different types of cannon. No tooling was available for this job, and production was required to begin at the earliest possible date. Of approximately 35 special parts manufactured at the Arsenal in connection with this mechanism, seven were precision cast. Fig. 6 shows these parts in the as-cast condition.

Substantial reductions in manufacturing and tooling costs were accomplished by precision casting all these mechanism components except the operating lever *G*. Job analysis indicated that for quantity manufacture of component *G* drop forgings would be most economical, and these were ordered immediately. Up to the time when first deliveries of the forgings could be obtained, however, approximately 1200 precision castings of this part were utilized, making possible earlier delivery of the complete mechanism to the using services.

Parts *A*, *B* and *C* are particularly well suited for precision investment casting with savings in production time of 1.0, 1.1 and 1.3 hr. respectively resulting from use of this method of manufacture. After the casting operation, parts *A* and *B* require only the removal of the gate stub and the drilling of a hole. Part *C* requires the removal of gate material and a clean up operation on the inside diameter. Figs. 7, 8 and 9 indicate the de-



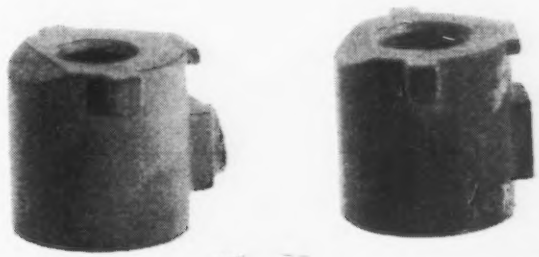


FIG. 9—Careful handling of wax patterns of extractor *C* is necessary if certain dimensions are to be maintained within drawing specification. Drawing tolerances indicate the approximate practical limit to which parts of this design can be precision cast at Watervliet Arsenal. This 0.25 per cent carbon alloy steel is case hardened, 0.005—0.010 in. deep, Rockwell 15N 86-89.

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TABLE I

Cost of Machined Parts Compared With Costs of Precision Cast Parts

Part	Approximate Quantity Required	Estimated Cost Part Machined*	Cost of Precision Cast Parts**	Unit Production Savings	Hours Tooling Saved by Prec. Casting
A	4000	$3.93	$1.53	$2.40	450
B	4000	4.00	1.36	2.64	500
C	4000	5.50	2.58	2.92	350
D	4000	9.85	9.35	0.50	200,
E	1500	2.04	1.57	0.47	150
F	1100	3.22	1.97	1.25	300
G	1200	7.18	7.53	***	****
H	1000	10.24	5.93	4.31	790

* Includes direct labor, overhead and material. (Tooling costs not included.)
** Cost of precision cast parts analyzed in Table II.
*** Part now machined from drop forging.
**** Tooling cost same for casting and drop forging.

gree of completion to which these parts are cast and the dimensional precision required for each.

Two additional precision cast components are illustrated in Figs. 10 and 11. Fig. 10 shows a part required in a heavy field gun mechanism. Precision casting replaces numerous machining operations and yields the necessary precision. For completion this casting requires only removal of gate metal, the tapping of the hole and a small amount of bench work. A unit saving of 2.3 hr. production time is effected by casting this part which was formerly machined from bar stock.

Fig. 11 shows a part recently precision cast in connection with the development of a new small arms weapon. Only 100 of this intricate piece were required and tooling was not available. Its manufacture by conventional machining methods would have necessitated using highly skilled mechanics and toolroom methods or building the expensive tools and fixtures required in connection with its manufacture by lesser skilled help. The precision casting of the part is estimated to have reduced manufacturing costs by an estimated 90 per cent for the small quantity involved.

Should this new weapon show the desired operating characteristics, a requirement for many thousand of this component may develop. Then the unit cost for the part produced by conventional manufacturing methods would be reduced to a small fraction of the unit cost for machining the initial lot of 100, and it is possible that direct manufacturing costs would be lower by machining methods than by precision casting. Choice of a manufacturing method would hinge on overall production costs, including the tooling costs by each method apportioned over the total quantity required. Precision casting would definitely be more economical for any quantity up to several thousand.

Table I compares estimated costs, excluding tooling, for machining the cannon parts illustrated in Figs. 7 through 10 with costs for producing them as precision castings. Estimated savings in tooling time are also shown for each component. Table II shows a breakdown of precision casting costs, indicating that portion of total cost attributable to direct labor, overhead and materials.

Savings accomplished at the Arsenal during the past year by using the investment casting process as a supplement to conventional machining methods have totaled many thousands of dollars. This has been accomplished with an installation for precision casting which occupies less than 1600 sq. ft. of manufacturing floor space and with production equipment valued at less than $10,000. All related heat treating, finish machining and inspection facilities were available at the Arsenal prior to initiating precision casting production.

TABLE II

Analysis of Production Costs for Precision Cast Parts

Part	Cost of Casting Operations				Cost of Required Finishing Operations***	Total Unit Cost
	Direct Labor*	Overhead	Material**	Total		
A	$0.24	$0.36	$0.14	$0.74	$0.79	$1.53
B	0.16	0.24	0.04	0.44	0.92	1.36
C	0.32	0.48	0.20	1.00	1.58	2.58
D	0.59	0.88	0.53	2.00	7.35	9.35
E	0.22	0.33	0.10	0.65	0.92	1.57
F	0.30	0.45	0.30	1.05	0.92	1.97
G	0.74	1.11	0.95	2.80	4.73	7.53
H	0.40	0.60	0.35	1.35	4.58	5.93

* Average cost direct labor, $0.90 per hr.
** Material costs include costs of steel, wax, refractory and chemicals, all of which are charged directly.
*** Costs include direct labor and overhead.

Mechanical Properties

Useful data has been obtained on the physical and metallurgical characteristics of steel parts gravity cast in refractory investment molds heated to 1400 deg. F. In the as-cast condition, grain size is large and the steel has little ductility. Hard spots are encountered in machining as-cast parts containing more than 0.30 per cent carbon. Standard practice at Watervliet Arsenal is to give all precision castings a standard heat treatment before forwarding them to the machine shops for finishing. This usually consists of heating the parts to 1800 deg. F., holding for 1 hr. and slow cooling to room temperature. After this treatment the cast parts compare favorably from the standpoint of yield and tensile strengths with parts machined from drop forgings or bar stock of the same chemical analysis and subjected to similar heat treatment. Ductility values for gravity poured investment castings are often lower, however, than those for rolled or forged material. The general level of these values depends primarily on the design of the component being cast, and are highest when design is such that proper directional solidification can be obtained. For parts with long sections without taper or padding, ductility values often vary widely as well as being generally low.

Extreme care must be taken to provide gating and feeding which will insure the obtaining of sound castings and minimize a so-called "microshrink" condition which appears to be the primary cause of the lower ductility. The metal is cast into highly refractory molds at 1400 deg. F., and heat dissipation is slow, the result of the refractory nature of the mold and the lower-than-usual temperature differential between mold and metal. As a consequence, it is believed that a considerable volume of metal at the centers of the castings tends to reach the slushy stage just prior to solidification at about the same time—thus restricting normal feeding action by the still fluid risers and having the effect of expanding the zone of expected centerline shrinkage.

Extremely high ductility is not

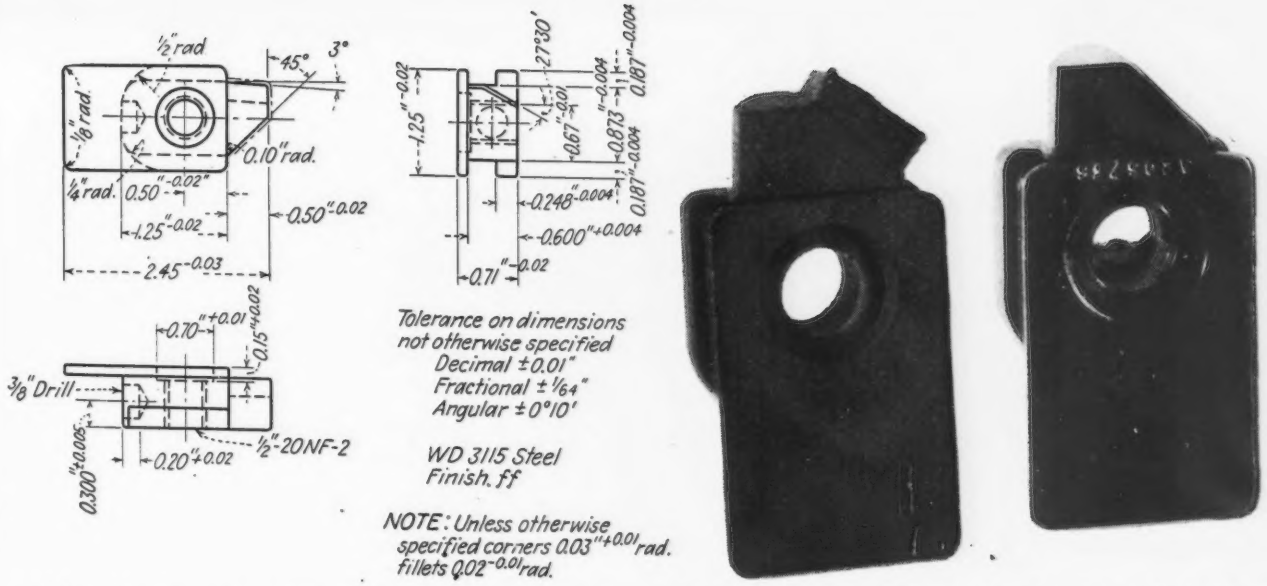

FIG. 10—Approximately 2.3 production hours are saved by precision casting latch *H*. (See Tables I and II.) The part is carburized to a depth of 0.01 in. where indicated by dot and dash lines; hardness, Rockwell A 79-84.

normally a requirement in those mechanism parts being cast for cannon at Watervliet Arsenal; yield strength, hardness, fatigue characteristics and surface smoothness are the more important considerations. To guarantee, however, the complete suitability of investment castings for each new application, proof testing designed to impose considerably greater hardship than will be encountered in actual service is performed on each new design cast part.

It should be mentioned that surface decarburization sufficient to affect strength, fatigue and wear characteristics is sometimes encountered in the cast-to-size parts. This is a matter of serious concern, and heat treatment in an atmosphere so controlled as to restore the correct amount of carbon to the depleted surfaces is required.

The necessary control of strength and wear characteristics of cannon mechanism parts is accomplished by specifying and controlling the anal-

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FIG. 11—Precision cast release showing the intricacy of design which can be reproduced by the investment casting process. The piece is heat treated to a hardness of Rockwell C 43-47 and is then Parkerized. Holes are finished by reaming.

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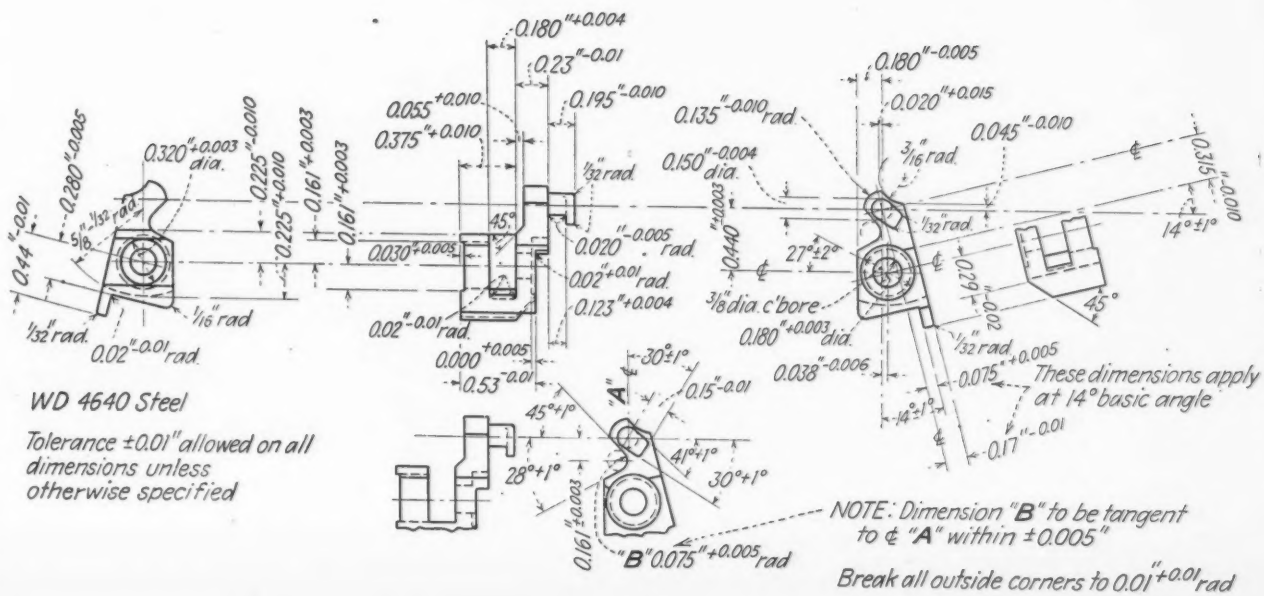

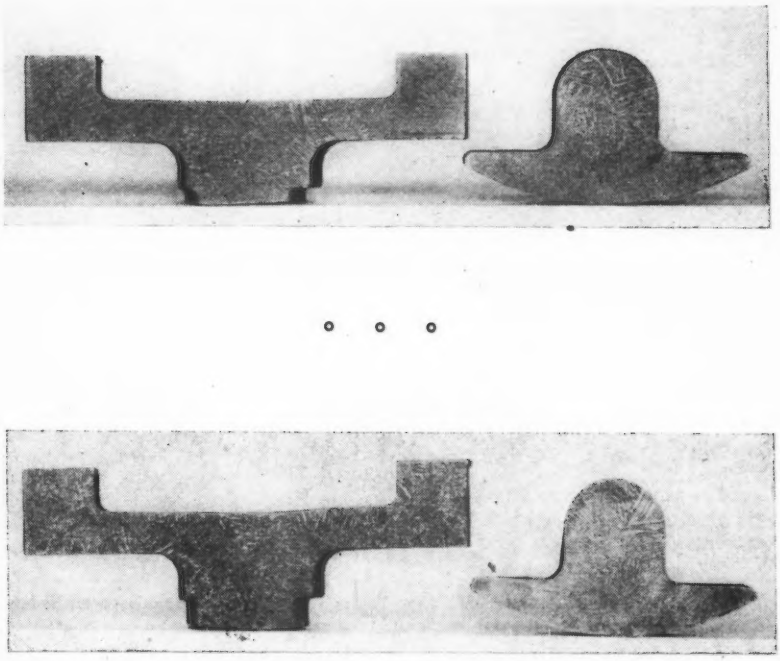

FIG. 12—Macrostructures of investment cast parts in as-cast and heat-treated conditions (etched in hot 1:1 hydrochloric acid).

yses of steels used for each design part and by checking the final hardness of each piece. For deep hardened parts, a Rockwell C range of five points is the customary allowance. For case carburized work, a hardness range of Rockwell A 79-84 is usually specified. Rigid control of chemical analysis is necessary if batch heat treatment of the parts cast from many small heats of steel is to bring them all within specified hardness ranges.

Homogenizing Heat Treatment

Table III shows the results of chemical and physical tests of investment cast samples from five average heats of SAE 4130 steel. Two 0.252 in. diameter tensile test bars, standard except that gage sections were only ½ in. long, were gravity cast from each of these heats. Diameters along the gage lengths and gripping threads were cast to size and required only minor clean-up. Chips for chemical analysis were taken from the feeding heads for the bars. The test pieces were given a homogenizing heat treatment at 1800 deg. F., slow-cooled, reheated and held 1 hr. at 1550 deg. F., quenched in oil and drawn to a Rockwell C hardness range of 27-31. The range in hardness, tensile strength and ductility values shown in this table are typical of the variance in properties to be expected in batch heat treated investment cast parts, the product of many different heats.

Metallurgical examination indicates that properly fed investment cast parts are reasonably sound and dense, and that suitable heat treatment will develop homogeneous fine grained structures comparable to those obtained in rolled or forged material of similar chemical analysis. Fig. 12 shows sections of castings split longitudinally and macro etched. Fig. 13 shows the micro structures obtained in investment cast SAE 4130 steel at the various stages of heat treatment given the tensile test bars whose properties are shown in Table III.

TABLE III

Chemical Analyses and Mechanical Properties for Five Average Heats of Investment Cast SAE 4130 Steel

Heat	Chemical Composition, Per Cent						
	C	Mn	Si	P	S	Cr	Mo
A	0.34	0.64	0.21	0.017	0.014	0.89	0.17
B	0.34	0.68	0.54	0.018	0.014	0.94	0.16
C	0.35	0.59	0.34	0.020	0.012	0.94	0.17
D	0.34	0.73	0.32	0.021	0.015	0.91	0.20
E	0.31	0.53	0.29	0.014	0.012	0.98	0.16

Heat Test Bar	Mechanical Properties		
	Hardness Rockwell C*	Tensile Strength Lb. per Sq. In.	Ductility Reduction in Area Per Cent
A-1	29-30	140,500	24.9
A-2	28-29	129,200	40.2
B-1	29-31	138,000	15.4
B-2	28-30	141,000	23.5
C-1	31	140,000	28.8
C-2	28-30	**	**
D-1	28	139,000	17.8
D-2	27-29	***	***
E-1	29-31	139,000	31.8
E-2	29-30	130,500	43.0

* Oil quenched from 1550 deg. F., drawn at 1000 deg.
** Cast threads not satisfactory.
*** Gage length damaged.

Limitations Discussed

It is important to recognize the limitations of the investment casting process at its present stage of development. Experience at Watervliet Arsenal indicates that it can not usually compete economically with well tooled machining methods when very large quantities of parts are required. Parts which can be readily made on automatic machinery or forged or stamped with the necessary precision can be precision cast to advantage only when quantities are small and the differential between tooling costs for each method substantially favors the casting process.

Well defined limits exist as to the degree of precision and surface smoothness obtainable from the process as used at the Arsenal. Dimensions toleranced closer than plus or minus 0.002 in. per linear inch are difficult to maintain and often require finishing operations. Polishing or finish grinding is usually necessary for important contact points and bearing surfaces. Additional investigation of the mechanical properties of investment cast material is considered advisable before precision cast parts are used in applications where ductility or impact strength values are specified.

On the other hand, physical and

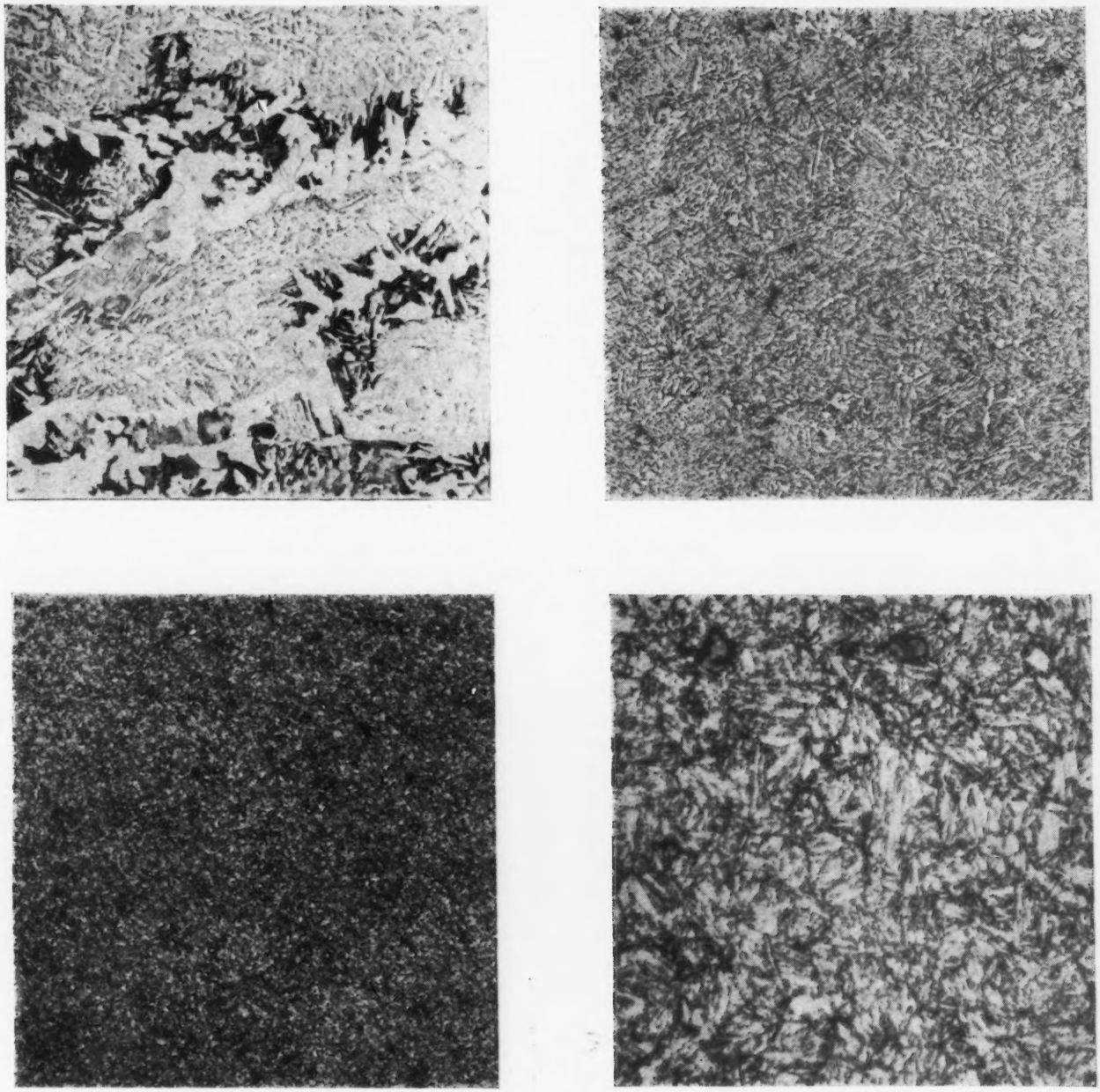

FIG. 13—Microstructure of investment cast SAE 4130 steel. (upper left) As cast, Nital etch, 100X: (upper right) normalized, Nital, 100X; (lower left) quenched and drawn, Picral etch, 100X, and (lower right) detail of C, Picral etch, 1000X.

metallurgical tests indicate the complete suitability of precision cast material for countless uses. A surprisingly small expenditure for equipment provides a manufacturer with an extremely versatile production setup. Wax injection, investing, mold heating, melting, cut-off, and blasting equipment can be selected so as to accommodate parts weighing from less than an ounce to several pounds when cast in steel. In this connection, professionally built production equipment of improved design should appear on the market in the near future, and its effect should be to reduce present manufacturing costs for investment cast parts and improve their precision.

The casting technique releases the design engineer from many restrictions imposed by conventional machining practices; a complicated shape properly designed for casting is as easy and economical to produce as a simple part. It has been used to great advantage for manufacturing intricate shapes of highly refractory alloys which can be forged or machined only at great expense and with considerable difficulty. Finally, the investment casting process has been proved a highly economical and satisfactory means for producing small and medium quantities of many precision parts that require extensive tooling and considerable production time when manufactured by ordinary methods.

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Result of Stabilizing Heat Treatment

As a result of the rather conflicting information available concerning the effect of stabilizing and stress relief heat treatment upon welded 18-8 stainless steel, the Ryan Aeronautical Co. laboratory has recently concluded a series of investigations on this subject. These tests were designed to determine the particular benefits, if any, which might be imparted by these processes to 18-8 AISI type 321 and type 347 stainless steels for use on aircraft engine exhaust manifolds. Benefits which would be reflected in greater serviceability of the aircraft exhaust manifolds manufactured from this steel were of prime importance to this inquiry.

When 18-8 type stainless steel was first used on exhaust manifolds, it

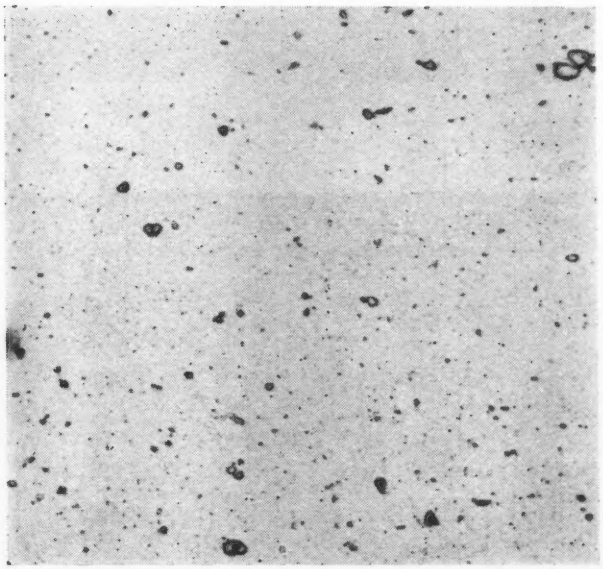

FIG. 1—Photomicrograph showing the random distribution carbides in type 347 columbium-stabilized stainless steel after sensitization. Magnification 500X.

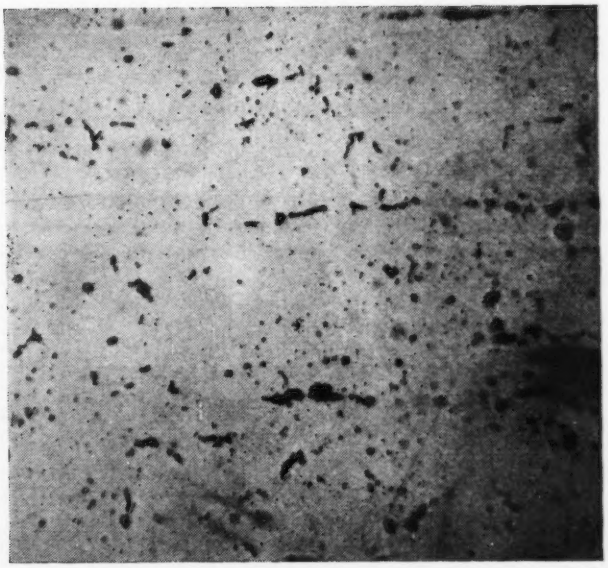

FIG. 2—Photomicrograph showing the random distribution of carbides in a special low carbon (0.025 per cent) type 304 stainless steel after sensitization. (500X.)

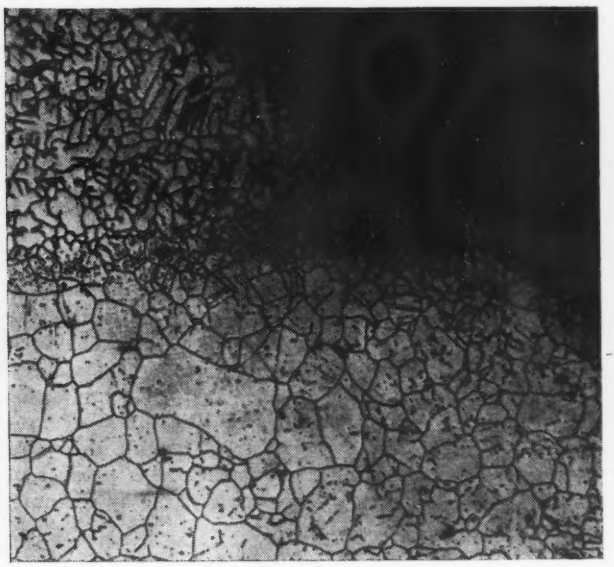

FIG. 3—Etched photomicrograph of the weld zone of a stainless steel exhaust manifold section which has been in service 4000 hr. Note the well defined networks of carbides which did not affect its service life. (100X.)

FIG. 4—Unetched photomicrograph of the weld zone of the exhaust manifold which had been in service 4000 hr. This picture indicates the depth of corrosion which occurred during the life of the manifold—only 0.005 in. (100X.)

On Welded 18-8 Stainless

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. . . Tests carried out over a period of several years indicate that stabilizing treatment obtained by heating welded sections of 18-8 types 321 and 347 stainless steel for 30 min. at 1650 deg. F. exerts some small, but inconclusively beneficial results in helping the metal resist corrosive aqueous solutions and electrolytes (Strauss test). There appears to be no justification, however, that this type of heat treatment increases the resistance of aircraft engine exhaust manifolds to intergranular attack by exhaust gases at elevated temperatures.

was soon discovered that the material was rapidly attacked by the exhaust gases. Closer investigation disclosed that the carbides which were formed were not resistant to the product of combustion encountered in the exhaust gases. This led to the use of the stabilized grades type 347 and type 321 grades of stainless steel for use on exhaust manifolds.*

A review of the available literature shows that the addition of the columbium and titanium contained in these types was not the only means utilized to effect the stabilization of the material, but that stabilization was enhanced by a special heat treatment. This heat treatment for stabilization consisted of holding the fabricated part within a narrow temperature range of about 1575 to 1625 deg. F. for periods of time exceeding half an hour. This serves to stabilize the carbon by precipitating it as titanium or

* *See* "18-8 *Stainless Modified for Formability*," by *W. G. Hubbell, The Iron Age, Dec.* 7, 1944, *p.* 78. *See also "Heat Treating* 18-8 *Stainless in Salt Baths," by Keith Whitcomb, Ryan Aeronautical Co., The Iron Age, April* 26, 1945, *p.* 48.

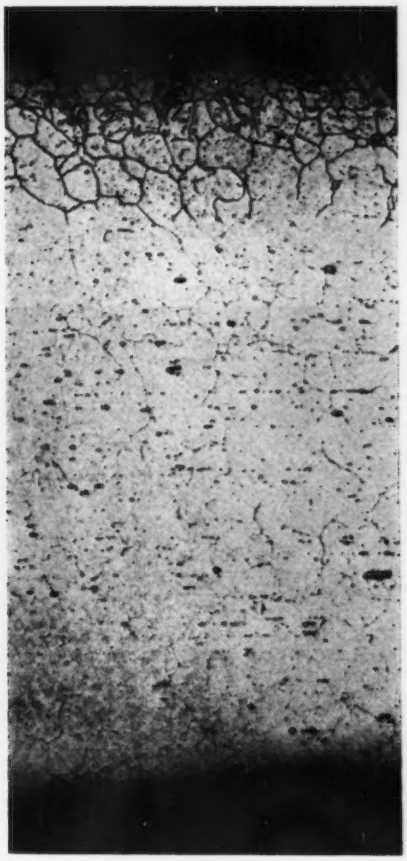

FIG. 5 — Etched photomicrograph of a stainless steel exhaust manifold section which had been in service 100 hr. This picture shows a progressive precipitation of carbides from the inside surface of the manifold. (100X.)

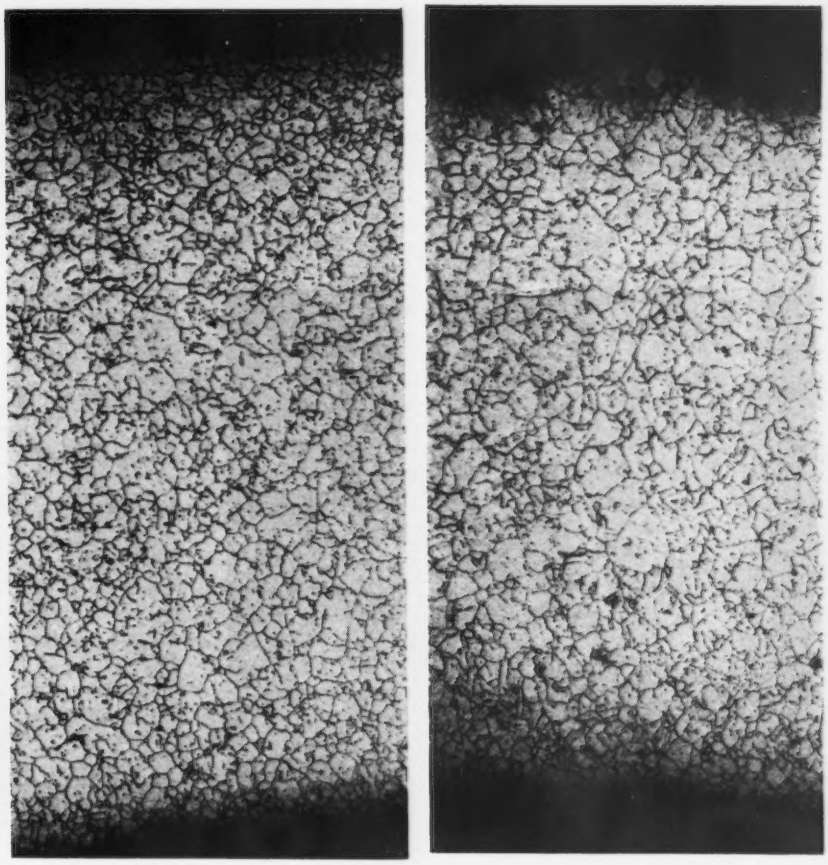

FIG. 6—This is a composite of two etched photomicrographs which discloses the comparative corrosive attack experienced by a section of a stainless steel exhaust manifold which had been in service 4000 hr. (left) and the same material after it had been subjected to a copper sulfate-sulfuric acid (Strauss Solution) solution for 48 hr. (right.) Note the extreme attack in the Strauss-tested sample. (100X.)

columbium carbides in random dispersion, Fig. 1, within the austenite grains. The result is that no carbon is available for the formation of harmful chromium carbides if the material is to be used within the so-called sensitizing range of approximately 900 to 1500 deg. F. In theory, without this stabilizing heat treatment and with the carbides in solid solution in a properly annealed austenitic steel, the available carbon might conceivably combine with the chromium carbides, and not with those of columbium or titanium. This could occur when the finished part was raised to the operating temperatures within the sensitizing range.

Heat Treatment Questioned

It is agreed, therefore, that the theory behind the stabilizing heat treatment on the stabilized grades of stainless steel is correct, and from the standpoint of resistance to corrosion in electrolytes and highly corrosive solutions, the stabilizing heat treatment may be required. However, correlation between corrosion under these conditions and resistance to the type of corrosion obtained from exhaust gases in exhaust manifolds is not satisfactory. The specification analyses covering the minimum amounts of columbium and titanium allowable in the 18-8 stainless steels are such that adequate stabilization of the carbides is present for exhaust manifold use without special heat treatments. Substantiating data have been accumulated by the Ryan laboratories which show that exhaust manifolds will resist corrosion where a combined precipitate of columbium or titanium carbides and chromium carbides exists after sensitizing the annealed material. To account for this, photomicrographs were taken which

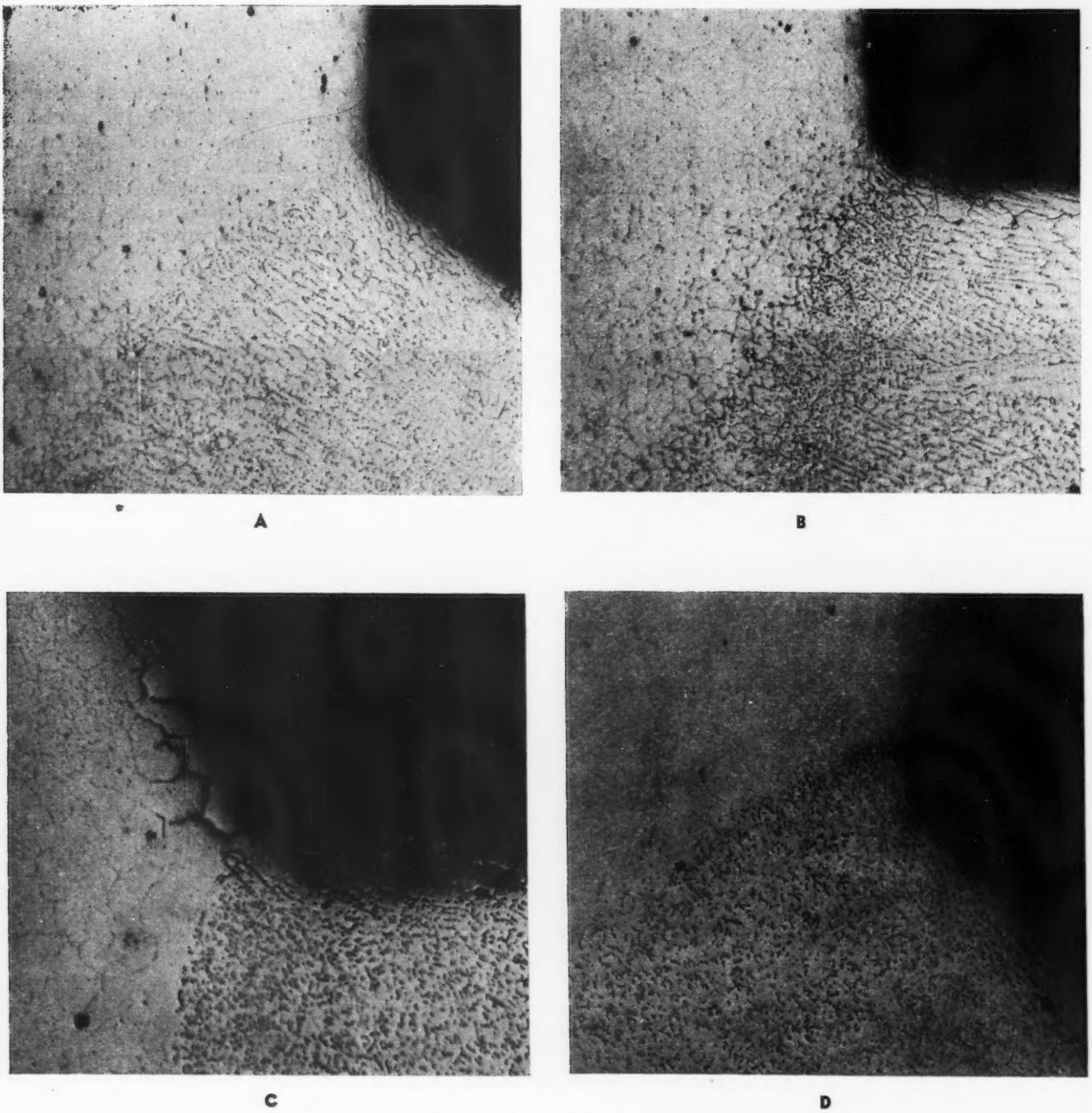

FIG. 7—These four photomicrographs show the structure of arc welded zones of (A) columbium-stabilized stainless steels in the sensitized and (B) unsensitized conditions, and (C) titanium stabilized stainless in the sensitized and (D) unsensitized condition, after being Strauss tested. There appears to be no appreciable difference between the sensitized and unsensitized samples of both types as indicated by intergranular corrosion. All samples have good corrosion resistance. (100X.)

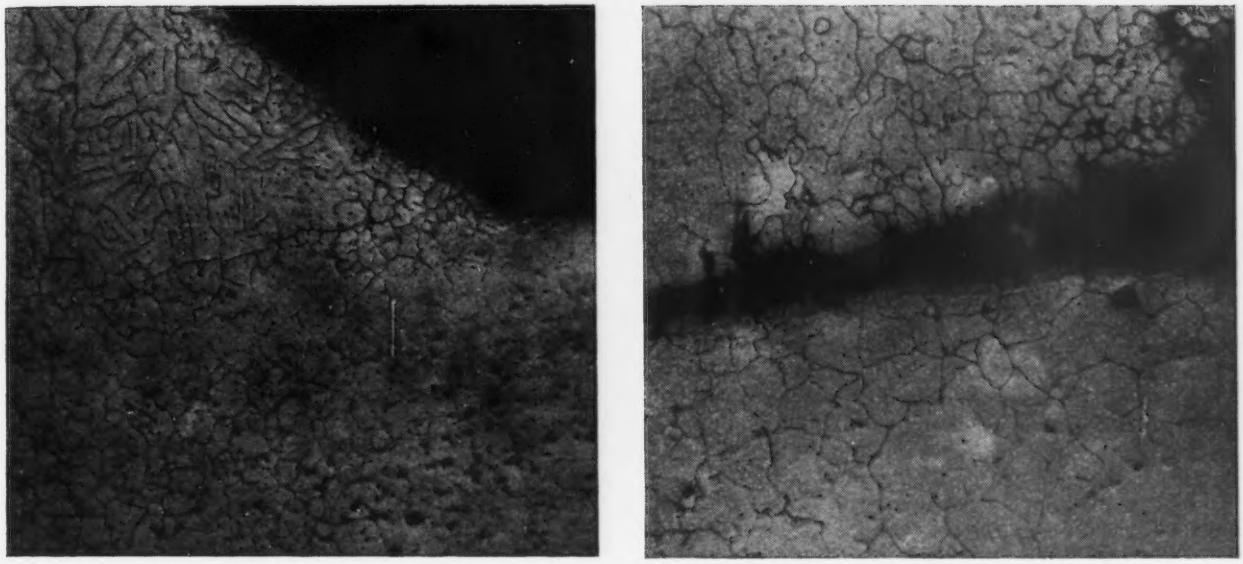

FIG. 8—These two photomicrographs are of gas-welded zones of (left) columbium-stabilized and (right) titanium-stabilized stainless steels in the sensitized condition and after the Strauss test. The columbium-stabilized sample shows good corrosion resistance. The titanium-stablized sample does not have as good corrosion resistance but in view of the severity of the Strauss test with respect to actual service conditions this is no cause for alarm.

show that even throughout the annealing heat treatment accomplished by cooling in air from 1950 to 2000 deg. F., a percentage of the carbon will remain combined with columbium or titanium. This leaves a small amount of uncombined carbon which in theory should combine with the chromium if held within the sensitizing range for a sufficient period of time.

The amount of available carbon left for the formation of chromium carbides is very small. The photomicrograph, Fig. 2, shows how the carbides after sensitization are distributed in an 18-8 type unstabilized stainless steel having 0.025 per cent carbon. From this, it is safe to assume that uncombined carbon of 0.025 per cent and possibly up to as high as 0.04 per cent, can be tolerated without fear of intergranular attack by exhaust gases. The reason for this is that the available carbon is so rapidly depleted in combining with the chromium that it remains in broken particles dispersed irregularly along grain boundaries. This condition leaves no continuous path for corrosion to take as in the case of a relatively high carbon, unstabilized 18-8 stainless steel. The microstructure of a completed exhaust manifold fabricated from type 347 or type 321 stainless steel shows columbium or titanium carbides at random dispersion within the austenitic grain and a dispersion of chromium carbides along grain boundaries spaced at such distances apart as to be no cause for concern over the ultimate serviceability of the exhaust manifold.

Service Tests Good

Special reference to photomicrograph, Fig. 3, should be made. This is a picture of a weld zone taken from an exhaust manifold which had been in continuous service from 1938 to 1944. The total flying time accumulated during these years approximates 4000 hr. which is in excess of the normal life of an exhaust manifold. This manifold was returned for the replacement of an exhaust port which had become worn mechanically during use. No breakdown of the metal in the form of cracking or corrosion was noted with the exception of an attack which had progressed to not over 0.005 in. on the inside surface of the body of the manifold. According to the criteria by which stainless steels and stainless steel welds are judged in many specifications, the photomicrograph of this manifold would be cause for great concern. This is due to the heavy network of carbides progressing throughout the original sheet, and an even heavier network in the region of the weld zone. Yet, the unetched photomicrograph, Fig. 4, showing the depth of corrosive attack by exhaust gases quite conclusively indicates that the presence of the carbides, even with their continuity becoming more definite, does not contribute to an excessive cause for corrosive attack by the exhaust gases. This bulwarks the contention that there is little or no relationship between the life of an exhaust manifold and the strict condition that all carbides must be combined with the columbium or titanium and dispersed within the austenite grain.

Further considerations are being given to the possibility of carbon absorption during the service life of exhaust manifolds. Photomicrographs Fig. 5, shows the cross-section of the body on a manifold which had been in service for 100 lb. hr. It is quite apparent that there is a relationship between the time in service and the type and distribution of carbides, dependent upon the service conditions. In connection with this, it has been found that sections taken from the manifolds which have been in service and subjected to the copper sulfate-sulfuric acid solution show up to a 20 per cent greater loss in thickness due to corrosion by the electrolytes after 48 hr. than will be obtained under service conditions up to 4000 hr., Fig. 6. It is from these tests that it is concluded that there is no correlation between the required accelerated corrosion tests as outlined by specification and actual service conditions. Some type of corrosive test is necessary to determine the susceptibility of the various grades of stainless steel to carbon precipitation, but it does not necessarily follow that if these materials should fail after being tested in strong electrolytes they will not give excellent service under operating conditions. Such tests are of little value if they cannot be correlated with conditions of service.

It is interesting to note that the wealth of material gleaned from ser-

vice reports over a period of years at the Ryan plant shows conclusively that there are two major types of manifold failures: One is due to fatigue failure which occurs in an open area subjected to strong pulsating forces—particularly in relatively flat areas. The other type of failure is encountered when severe stress raisers are present in a critical area and are typified by the base of hangers, the edge of doubler plates, or bolt holes. Both of these types may be rectified by change in design.

At various times the laboratory has been called upon to analyze the material in the areas of failure to determine if the condition of the material is at fault. As yet, we have been unable to show that excessive carbide precipitation or intergranular corrosion, or a combination of both, has any effect upon service failure which could be attributed to the conditions of electrolytic corrosion.

The following tests were run on columbium and titanium-stabilized material for the purpose of determining the effect of carbide distribution on corrosion resistance. For consistency of purpose, all tests in each group (columbium or titanium-stabilized) were run on the same heat of material. The specimens were processed in the following manner:

(1) Gas and arc weld samples were heat treated for various times at different temperatures. Half of the samples were sensitized.

(2) One production part was sectioned which contained both gas and arc welding. Samples were taken and processed in similar manner to the above.

(3) All samples of both the sensitized and unsensitized types were immersed in the copper sulfate-sulfuric acid solution (Strauss tested). The period of immersion was 48 hr.

(4) All samples were cross-sectioned for microscopic examination.

(5) Carbon and stabilizing element ratios were obtained on the materials tested and are as follows:

Columbium Stabilized	Per Cent	Titanium Stabilized	Per Cent
Carbon	0.07	Carbon	0.078
Columbium	0.88	Titanium	0.376

As represented by the photomicrographs, Fig. 7, all of the arc welds proved to be satisfactory in resistance to carbide precipitation and intergranular corrosion. Therefore, it appears that there is no need for post welding heat treatment of arc welds for any reason associated with carbide precipitation.

The gas weld of type 347 (columbium-stabilized) stainless shows better resistance to corrosive attack by electrolytes than that of type 321 (titanium-stabilized) in Fig. 8. These were treated for 2 to 3 min. at 1650 deg. F. for stress relief. It might be well to explain here that the Ryan Aeronautical Co. uses titanium-stabilized grade of 18-8 for manifold use only when the columbium grade is not available, and consequently there are insufficient actual service data to show relative service results.

However, other manufacturers of exhaust manifolds use titanium-stabilized steel almost exclusively and do not employ the stabilizing heat treatment for their products. Therefore, for the purposes of comparison, both grades are treated in this article as having the same end result in exhaust manifold use.

The bend tests on the weld zone after embrittlement tests required in Specification AN-QQ-S-757 proved to be more satisfactory than was expected. All but one sample, which cracked during preparation, withstood bending 180 deg. over a diameter equal to twice the thickness of the material, which was 0.043 in. Compression failures on the inside of the bend radius were noted in all specimens.

Conclusions

The results of the tests conducted by the Ryan laboratory have been crystallized into the conclusion that stabilizing treatment obtained by heating welded sections of 18-8 types 321 and 347 stainless steel for 30 min. at 1650 deg. F. exerts some small, but inconclusively beneficial results in one respect of minor significance—resistance to attack by corrosive aqueous solutions and electrolytes. There appears to be no justification for assuming that any substantial and practical benefit will be obtained by applying this type of heat treatment to aircraft exhaust manifolds. This conclusion has special significance when it is realized that aircraft exhaust manifolds encounter no environment in service as corrosive as the copper sulfate-sulfuric acid solution.

Aside from the metallurgical considerations, there are some manufacturing problems which would add to the cost of the finished product by heat treatment at 1600 deg. F. The scale that is formed at this temperature is very tight and thin. Removal of this scale by the usual acid pickling solutions is not readily accomplished. This results in added costs because of sandblasting or special pickling solutions which must be used. It would be necessary, too, to increase furnace capacity for heat treatment at this temperature for the desired length of time—namely, a minimum of ½ hr., instead of the usual annealing heat treatment time of from 10 to 15 min. Another manufacturing problem, which is not as serious as far as increase in cost is concerned, is the question of warpage on the finished part caused by this heat treatment.

It has long been known that the presence of precipitated carbides tends to raise the yield strength of the material when tested at room temperature. From this knowledge the question of increasing the yield strength under high temperature operation by the deliberate precipitation of carbides has at times been raised. Recently, a limited number of tests by other investigators (Miller, Benz, and Day—"Transactions of the A.S.M., Vol. 32, 1944, pp. 380-407) have indicated that at the elevated temperature (1100 deg. F.), stress creep strength is lowered from 10 to 20 per cent by this stabilizing heat treatment. These results would tend to bear out the theory that a small amount of carbide formation along grain boundaries and slip planes within the austenite grain would enhance the strength of the material at elevated temperatures. Data such as this may be a more important factor in determining the service life of an exhaust manifold than any actual corrosion of the material due to exhaust gases.

Serious considerations are in order to establish the allowable amount of chromium carbides, without the danger of intergranular corrosion, for the enhancement of the high temperature strength of the material. Factual data along these lines are lacking in detail but are proved in substance by the tens of thousands of exhaust manifolds which have been manufactured in the last eight years on which no stabilizing heat treatment has been given.

▲ ▲ ▲

Effect of Boron on Aluminum Castings

IN tests to determine the effects of boron trichloride on an aluminum permanent mold casting alloy, Northrop Aircraft, Inc., Hawthorne, Cal., determined that this modifier used in alloy 356, which contains 7 per cent silicon and 0.3 per cent magnesium, serves to refine the grain structure and modify the microporosity from the sharp shrink type to the rounded gas type of cavity, reduces mechanical properties of castings, increases brittleness but does not affect corrosion resistance or heat treatment characteristics of the alloy.

Tests were conducted with two ingots weighing approximately a pound each, one of which had been treated with boron trichloride. They were supplied by a local foundry. Two sections 3/16 in. thick were taken from each casting. Tensile test bars ¼ in. dia. by 1 in. gage length were cut from the center of each casting and pulled to destruction in a Southwark-Emery universal testing machine. Impact properties were determined from two specimens approximately ¾ in. sq. cut from each side of the castings. The mechanical properties are shown in the accompanying table.

Chemical analysis for titanium, magnesium and copper showed a slight drop in all three elements in the treated ingot as shown in the tabulation below:

	Analysis, Per Cent		
	Ti	Mg	Cu
Treated	0.10	0.174	0.034
Untreated ...	0.12	0.182	0.036

Visual examination of specimens polished and etched with 20 per cent caustic soda showed that the boron trichloride treated casting had a much finer grain structure and less segregation than the untreated casting. The cast dendritic structure was less pronounced and there was less interlocking of the dendrites, as shown in Fig. 1.

Microscopic examination at 100 diameters showed that the porosity cavities in the treated casting were rounded, typical of gas porosity. Those in the untreated casting were sharp and angular, more of the shrink porosity type, and located between the large dendritic grains.

Magnification at 500 diameters showed the silicon phase uniformly distributed through both specimens.

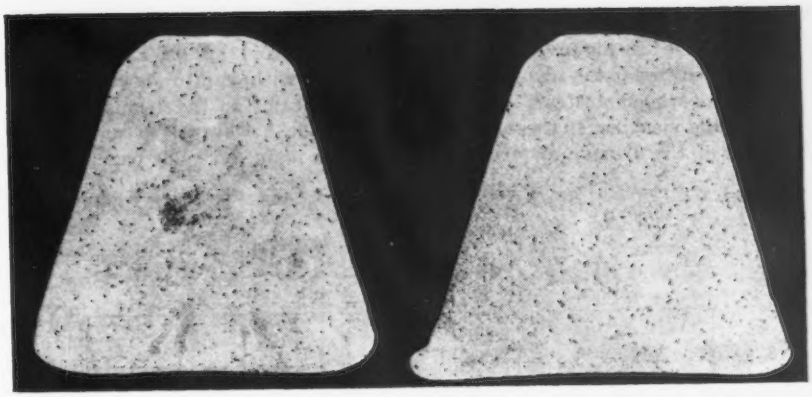

FIG. 1—Visual examination of etched sections from No. 356 aluminum alloy ingots indicates that the boron trichloride treated ingot (right) had a much finer grain and less segregation than the untreated ingot (left).

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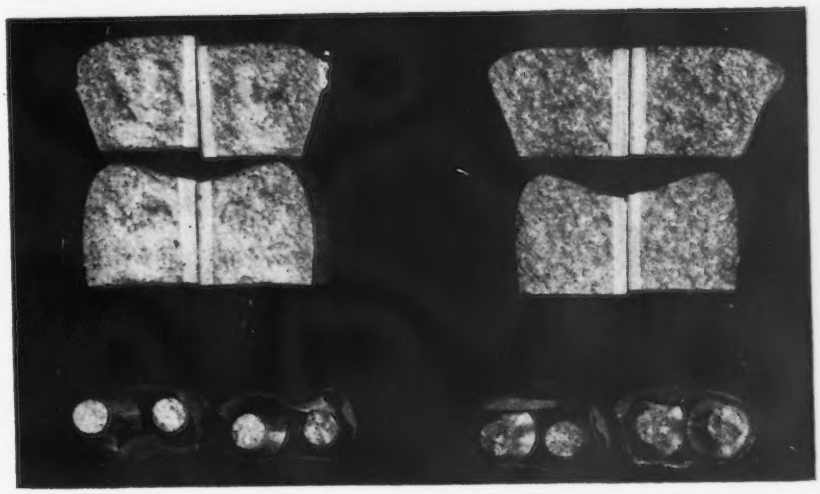

FIG. 2—The fracture of the treated No. 356 aluminum ingot (right) was fine and granular, while the fracture of the untreated ingot (left) was rough and coarse.

The Effect of Boron on 356 Aluminum Alloy Castings

	Boron Treated	Untreated
Ultimate strength	16,280	19,650
lb. per sq. in.	14,650	22,600
Elongation, per cent in 1 in.	2.0	3.0
	2.0	3.0
Impact resistance	Broke under two light hammer blows	Broke under 8 to 10 light blows
Hardness, Rockwell B	88 to 95	84 to 90

In the untreated casting the silicon needles were longer and larger and located at the interstices of the dendrites where their interlocking effect could account for the improved mechanical properties.

The fracture of the treated ingot was fine and granular while that of the untreated ingot was rough and coarse, as shown in Fig. 2.

Tested in a standard salt spray cabinet for 250 hr., there was no significant difference in resistance to corrosion.

SETUP CHARTS For Automatic

CONOMATICS are somewhat similar to the Acme-Gridleys charted in the preceding article except that the main drum shaft is located overhead instead of in the base of the machine. In these machines also all of the drum cams are located on the main camshaft. The various tool slides and auxiliary mechanisms are actuated by lever linkages connected with cam followers actuated by the cams on the drums. The main tool slide, however, is actuated directly by the main tool slide cam. The drive of the Conomatic is slightly different from that of the Acme-Gridleys in that a reverse drive is provided for setting up the machine and the change gear arrangements are such as to give a bigger range of feeds. However, the range of spindle speeds is smaller in that there is no high and low range provided but merely the normal span of the change gears themselves.

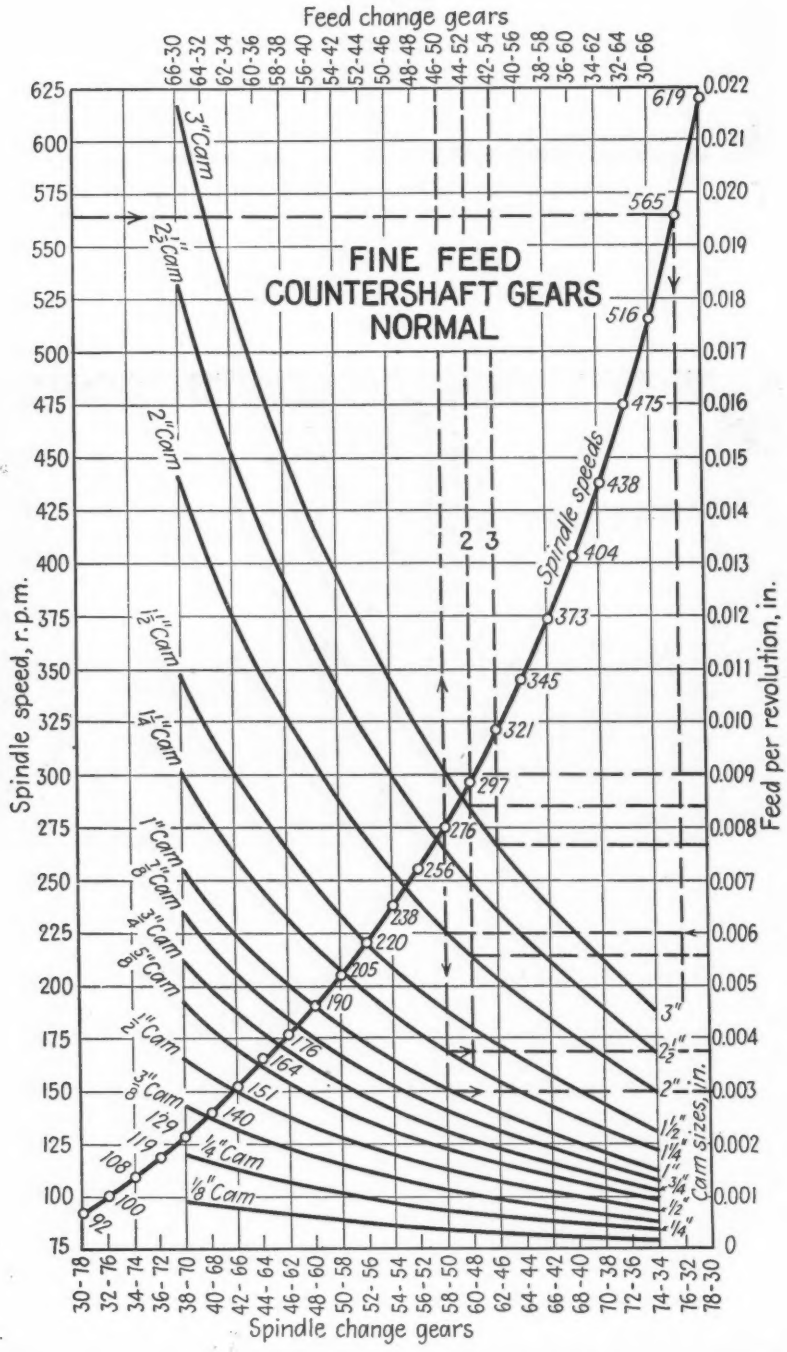

FIG. 12—Fine feed change gear setups, countershaft gears normal, for 2⅝ in. Conomatics.

The spindle change gears are located in the inner rear portion of the right hand tower of the machine. The enclosure is provided with a streamlined cover held in place by Allen setscrews. The upper gear is the driver. The normal feed change gears are located in the right hand end-wall of the machine behind a sliding cover and the lower gear is the driver.

It will be noted that there are four setup charts provided for each machine, two marked normal and two marked reversed, for fine and coarse feeds respectively. Their use is the same as for the Acme-Gridleys discussed in the first article. This refers to the two gears on the feed drive jack shaft which are located in the left hand chamber on the front side of the right hand tower. They are accessible by removing the plate behind the feed clutch lever. Normally, the small gear is the driver and is in the lower position. In the reversed position the large gear becomes the driver with approximately double the feed. In addition to these possible changes, there is also the feed speed clutch whose lever is located on the front of the right hand tower. This gives a coarse or a fine feed depending whether the clutch lever is in the high or low position. The coarse and fine feed charts correspond.

Problem Worked Out

To illustrate the use of the charts, a problem will be worked out using data similar to that applied on the Acme-Gridley chart, Fig. 2 in the first article. As before, assume a feed of 0.006 in. on the principal operation on which a 2 in. cam rise is required. Since a much larger machine (2⅝ in.) is involved, however, it is assumed that on the Conomatic the spindle speed is 560 r.p.m. for the same

Screw Machines

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. . . In the second article of the series, the author presents six charts for the graphic solution of problems involving speeds and feeds, tapping and high speed drilling change gear ratios for Conomatic 2⅝ in. screw machines.

peripheral speed as on the Acme-Gridley where the problem was worked out on the basis of 1100 r.p.m. (1⅝ in. size). If the accompanying charts are examined, it will be found that for the sizes of cams to be used and the feeds desired, the "Fine Feed Chart, Countershaft Gears Normal," Fig. 12, is the proper one to use. If a line is drawn from the left margin of the chart, it will intersect the spindle speed curve near the right hand side of the chart. The nearest obtainable spindle speed is 565 r.p.m., and by dropping down to the bottom of the chart it is found that the 76-32 gear combination should be used.

As the principal operation is to have a 0.006 in. feed and 2 in. cam rise, a horizontal line is drawn from the right hand side of the chart at 0.006 in. to its intersection with the 2 in. cam curve. Following the vertical line through this intersection to the top of the chart, the 46/50 gear combination is found to be the proper one for the feed change gears, provided all other factors check. By dropping down the vertical line to its intersection with the 1 in. cam curve and reading to the right, a 0.003 in. feed is found and a 0.00375 in. feed is found for the 1¼ in. cam. For the 3 in. cam curve, a 0.009 in. feed is found. This is too high as there will be a 12½ per cent overload on these tools. Therefore, the reference line must be shifted to the right to lower the feed values. The 3 in. curve is followed to the next intersection to the right which gives a 0.0084 in. feed. If the reference line is followed in a downward direction, it will be found that the main feed has dropped to 0.0056 in. representing a 6-2/3 per cent slowdown in cycle time. If the next vertical reference line to the right is followed, a feed of 0.0076 in. is found which is well within the top limit set for the tools. This, however, would result in 8½ per cent slowdown in operations. These factors must be weighed and if the slight overload can be tolerated, the 44/52 gear combination would be used. If it cannot be tolerated, the 42/54 change gear combination must be selected. Whichever combination is decided upon, that reference line is used to determine the feeds for each

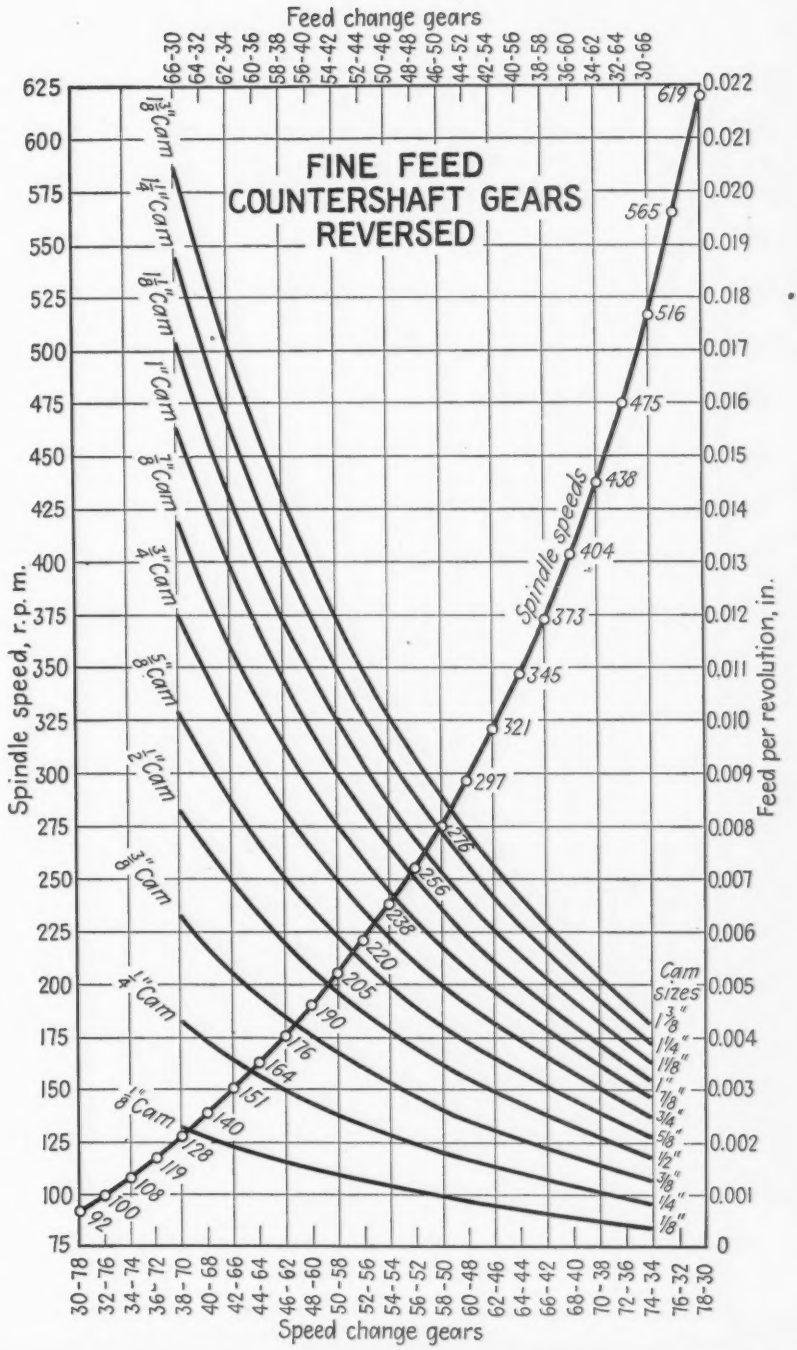
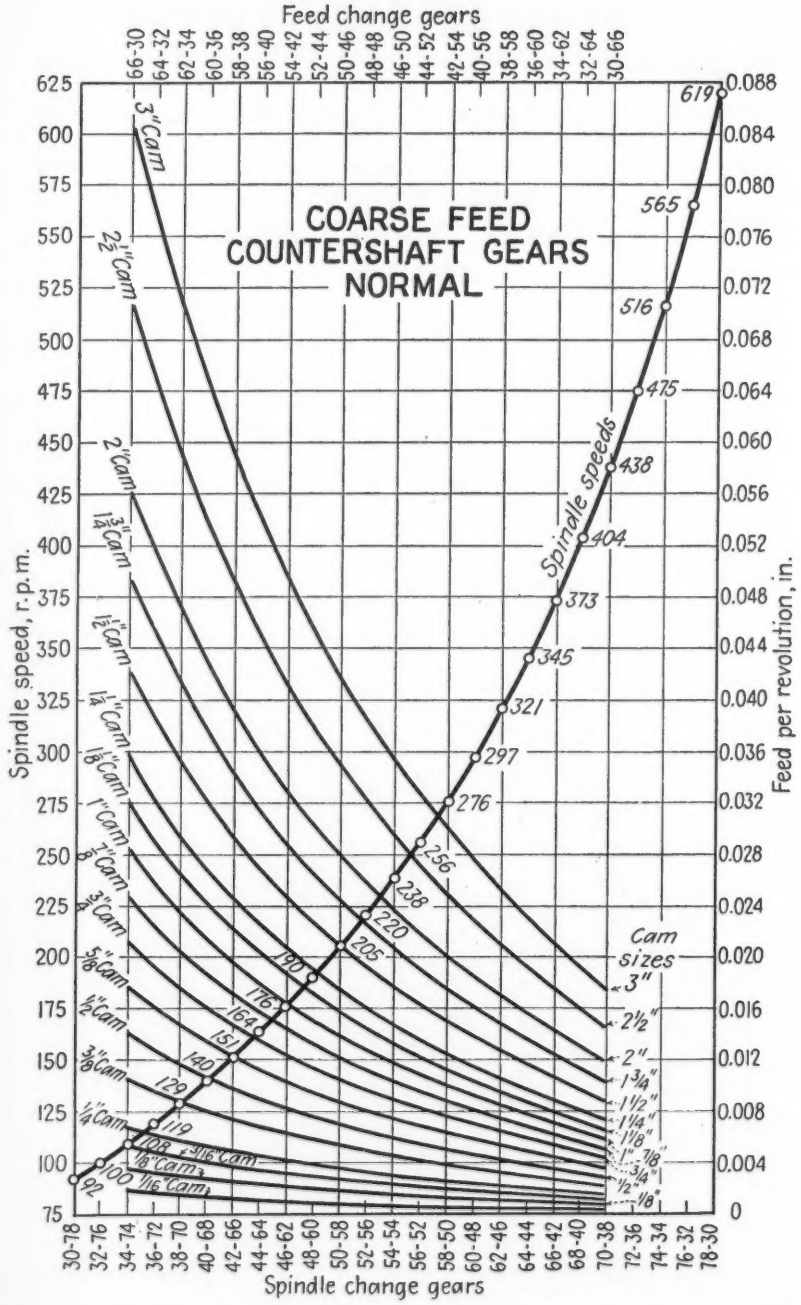
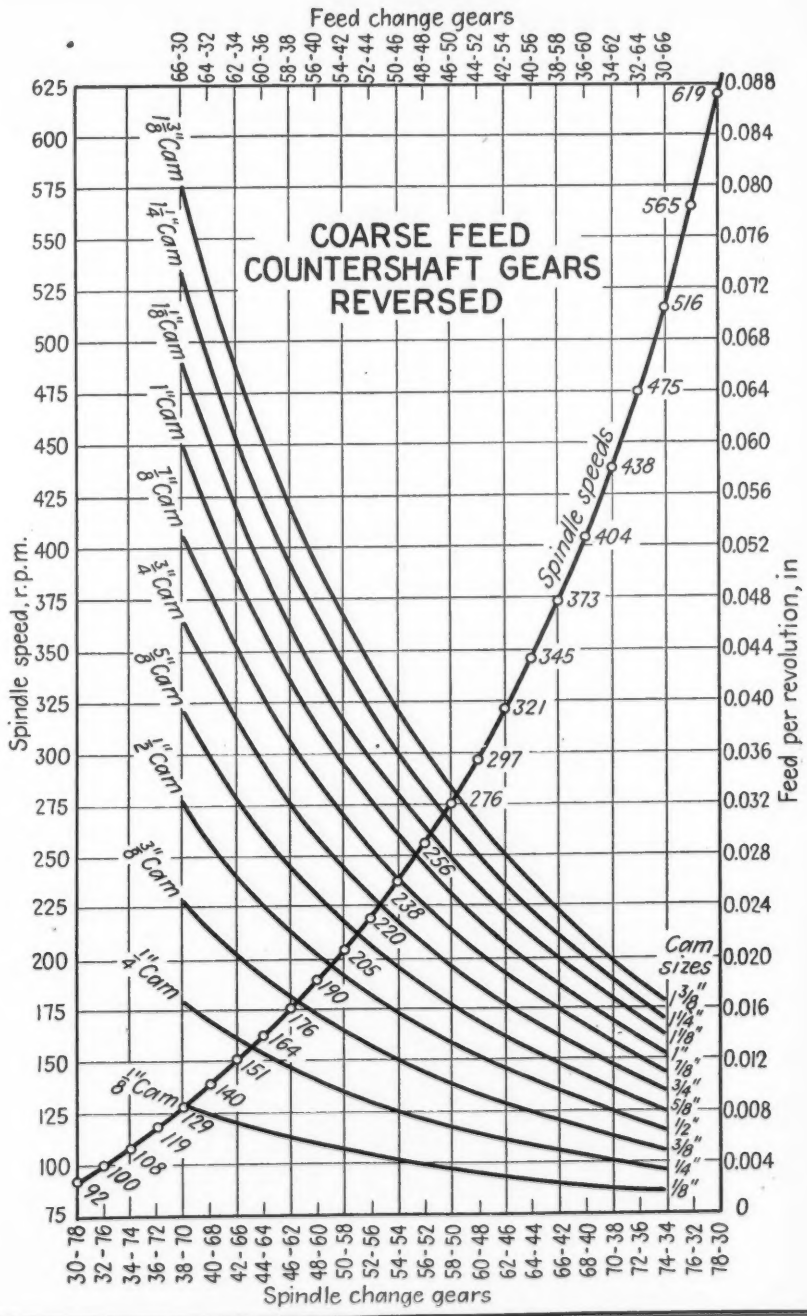


FIG. 13—Fine feed change gear setups, countershaft gears reversed, for 2⅝ in. Conomatics.



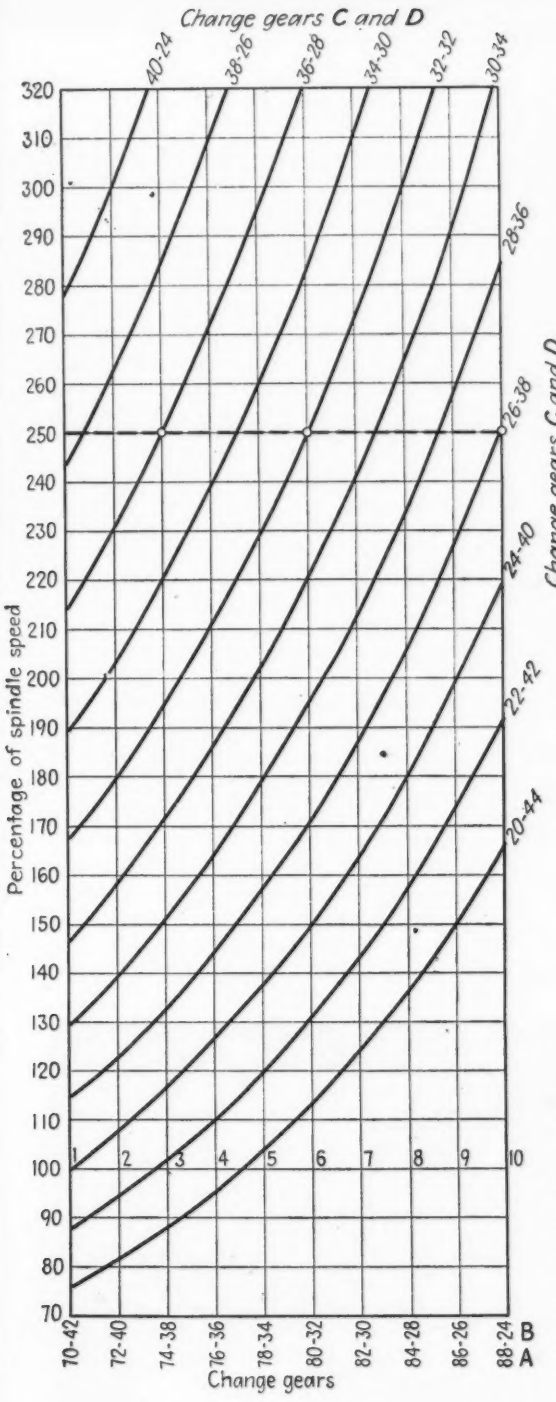
LEFT

FIG. 14—Coarse feed change gear setups, countershaft gears normal, for 2⅝ in. Conamatics.



RIGHT

FIG. 15—Coarse feed change gear setups, countershaft gears reversed, for 2⅝ in. Conamatics.



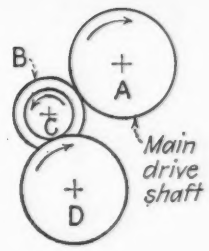
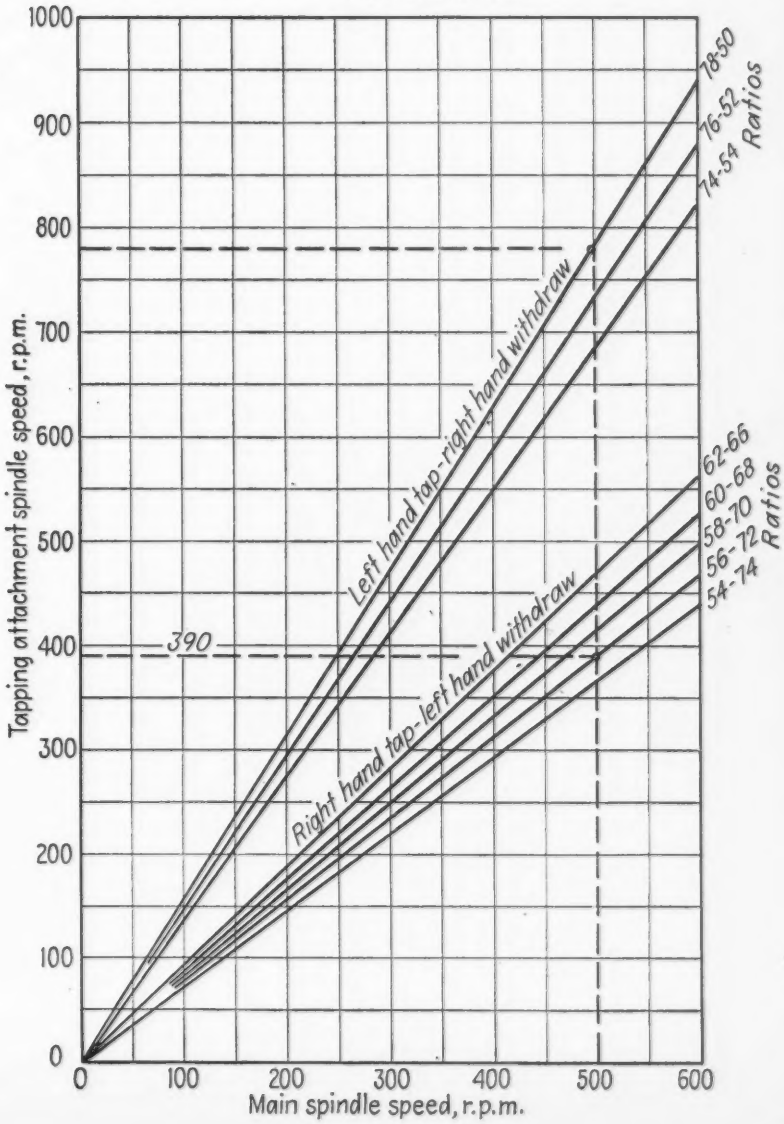


FIG. 17—Percentage spindle speed chart for high speed drilling on 2¼ and 2⅝ in. Conamatics.

a vertical line is drawn from the 500 r.p.m. line at the bottom of the chart to intersect the set of curves marked "Right Hand Tap." At this spindle speed, curves at 27.5, 60, 85, 110 and 135 r.p.m. are found. These numbers are determined by subtracting the speed of the tapping spindle as indicated by the scale at the left from the speed of the main spindle (500 r.p.m.). This would indicate that the 56/72 gear combination was wanted. For withdrawal, the 78/50 combination is used to keep the cycle time to a minimum.

In the Conomatics a complete range of drill speeds is provided by means of change gears. There are four gears in each set and in order to simplify the selection of the right gears, a chart is included entitled "Percentage Spindle Speed Chart for

FIG. 16—Tapping spindle gear ratios for 2¼ and 2⅝ in. Conamatics.



operation by determining the intersections of the corresponding cam curves illustrated previously for the 46/50 tooth gear combination.

Tapping Chart

The tapping spindle change gear chart, Fig. 16, is similar to that for the Acme-Gridleys except that more combinations are provided. For consideration of the tapping chart, assuming that the main spindle is operating at 500 r.p.m. and that a tapping speed of 100 r.p.m. is desired,

High Speed Drilling," Fig. 17. In using this chart, the rate at which it is desired to operate the drill must first be determined in terms of the percentage of the main spindle speed. The fact that the drill spindle and the work spindle travel in opposite direction must be taken into account in figuring this relationship. In other words, when the drill spindle is rotating at 100 per cent of the main spindle speed, the relative cutting speed will be twice the spindle speed. Using this percentage, the chart is entered at the corresponding horizontal line which is followed to the right to its intersection with a pair of the change gear curves. Where this line crosses the intersection of one of the sloping curves for change gears *C* and *D* with one of the vertical lines for change gears *A* and *B*, this is the proper gear combination to give the desired drill spindle speed.

Drilling Example

Assuming the main spindles are turning at 500 r.p.m. and a ¼ in. drill is used at 120 f.p.m. cutting speed, the drill must rotate at 1750 r.p.m. Since the spindles turn in opposite directions, the spindles must turn at 1250 r.p.m. (1750-500). This is 250 per cent of the main spindle speed. If a line is drawn at 250 per cent, there will be positive intersections at the 3rd, 6th and 10th lines. Any of these three combinations will give the result desired. Taking the first combination and observing the figures at either the top or the bottom of the line, it will be determined that the *A* gear should have 74 teeth, the *B* gear 38 teeth. Proceeding along the intersecting curve, it will be found that the *C* gear should have 36 teeth and the *D* gear 28 teeth.

[In the succeeding article, charts will be presented for 6-spindle New Britain-Gridley screw machines.]

Styling Heavy Machinery

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By DAVID MAXWELL

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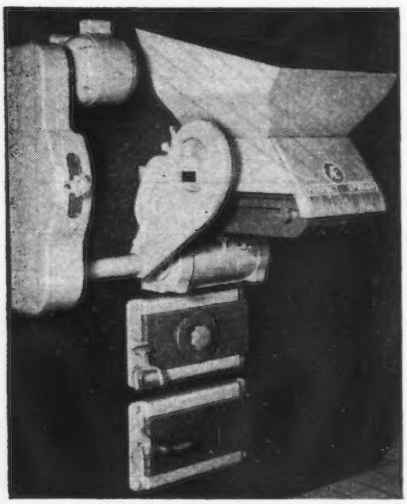
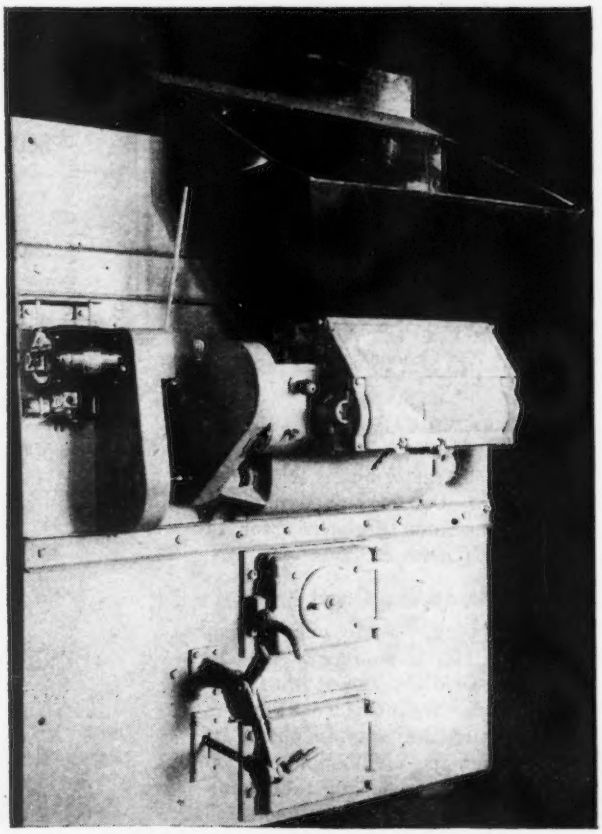
MANUFACTURERS of heavy equipment in the past have employed design to improve their products but not to an extent even approximating that of automobile, radio or refrigerator manufacturers. They have been content to style for greater utility and performance, with emphasis on better machines for less money. But design of heavy machinery from the standpoint of eye appeal has been somewhat underplayed.

The prospective purchaser of any commodity—whether it be a simple domestic appliance, an automobile, a tooth brush, or a drill press—is influenced to buy by the three main factors of price, utility and appearance. If price and utility are equal in several comparable products, the determining factor becomes largely one of appearance or style. One prime fact is inescapable, that style has sold inferior products against the competition of other more soundly engineered products which were unfortunately lacking in eye appeal.

Styling of heavy machinery, as in almost all consumer products, will increase in importance after the war. Style will greatly influence sale to the plant operator. Style, after inducing purchase, will encourage the machine operator to maintain the machine in its attractive and original condition.

The "before and after" pictures of American Engineering Co. "Perfect Spread" stoker illustrate a redesign for efficiency and eye appeal. Controls have been simplified, moving parts protected, and surfaces specially contoured to lessen the collection of dust. Although a stoker is not planned to be exhibited to the public and few persons other than the boiler room operators come into contact with this machine, yet because of its design there is likely to be an increased incentive on the part of the worker to maintain it spick and span.





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At right, American Engineering Co. "Perfect Spread" stoker before redesign by an industrial design concern. At the left is the same stoker with certain parts eliminated, moving parts protected and surfaces especially contoured to cut down dust.

Progress Report On Carbide Hobs

. . . At the special annual meeting of the American Gear Manufacturers Association held in Hot Springs last month, the Navy Department made a second* report on tests made at the Joshua Hendy Iron Works, Sunnyvale, Cal., on carbide hobs for cutting marine propulsion gear teeth. The data indicate that, with a specially modified hobbing machine, a steel pinion of 285 Brinell hardness can be cut successfully at speeds of around 200 ft. per min. with a 6 in. diameter hob.

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By LT. ALFRED J. KROGG, U.S.N.R.
and
RICHARD W. RIGHTER
Engineer, Navy Department

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CEMENTED carbide hobs are known to require higher speeds than standard high speed steel hobs, and such speeds are not within the available range of standard commercial gear hobbers used for large marine gears. From an economic standpoint it was considered inadvisable to manufacture a gear hobber designed specifically for carbide hobs until the possibilities of modifying present hobbers for higher speeds had been explored.

The first attempt to modify a gear hobber for carbide hobs gave very promising results. A 72 in. Gould & Eberhardt hobbing machine was used for the tests reported herein, and was modified as follows:

(a) Spindle speed increased to 215 r.p.m. by gear ratio changes of the hob spindle gear and pinion, and two new gears in the speed change gear box.

(b) Spindle bearing, intermediate and end arbor bearings were equipped with bronze bushings replacing the original steel bushings. (Note: G. & E. does not believe any great advantage was gained by this change.)

(c) Bearings on the swivel head, swivel head slide and drive shafts were lubricated by a Bijur pressure oiling pump through a system of pipes and metering valves. Also, oil for lubricating and cooling was circulated through the hob drive 90 deg. angle gear box at the lower end of the stanchion, and the one on the swivel slide.

(d) An overarm tied in the work support column with the stanchion and included a three point steadyrest for the workpiece.

(e) A 73 lb. flywheel was mounted to the free end of the hob arbor to add stability to the spindle in maintaining uniform angular velocity. This was about as heavy a flywheel as could be used under the existing setup, but it is believed that a weight of 150 lb. supported between bearings as close to the cutter as possible would be more effective.

Analysis with a stroboscope indicated uniform velocity at the spindle and a tachometer reading taken in conjunction with this instrument showed the speed to be 224 r.p.m. although the machine was geared for 215 r.p.m. This difference was believed due to slight speed variation in the driving motor. The speed of the bronze index worm was calculated to be 537 r.p.m. for 224 r.p.m. of the spindle. Visual examination of the index worm showed it to be in good condition after tests were concluded, and the temperature outside the index worm bracket is indicated together with other critical points of the machine in the chart to the left.

Point of Recording	Spindle Speed R.P.M.	Max. Temp. Deg. F.
Cutter-drive vertical shaft at slide	133	112
	174	113
	224	122
Angular bearing on cutter drive	133	118
	174	123
	224	131
Index worm bracket	133	109
	174	108
	224	109
Housing of pinion driving spindle	133	115
	174	115
	224	122
Spindle gear hubs	133	Checked by hand—O.K.
	174	111
	224	Checked by hand—O.K.

All test cuts were made on standard size C-3 second reduction pinions 5 D.P., 100 teeth, 18 deg., 18 min. 6 sec. helix angle, 21½ in. diameter, 18⅞ in. face width, 95½ in. overall length, and except for the one used for the first trial cut the Brinnell hardness reading of the pinions was 282. Chemical analysis of the material is as follows:

Element	Per Cent
Carbon	0.29
Manganese	0.69
Silicon	0.24
Phosphorus	0.013
Sulphur	0.009
Chromium	0.58
Vanadium	0.09
Nickel	2.99
Molybdenum	0.32

Heat treatment by normalizing at 1600 to 1650 deg. F. for 18 hr. and a

*Carbide Tests Feature AGMA Meeting." THE IRON AGE, Nov. 9, 1944, in which the first report was given by the author. See also the article, "Further Tests Reported on Carbide Hobs," March 15, 1945, for a preliminary report of the tests reported in this issue.

draw at 1000 deg. F. for 18 hr. gave the following transverse mechanical properties taken at about the pitch diameter:

Tensile strength, lb. per sq. in.	134,000
Yield point, lb. per sq. in.	111,000
Elongation in 2 in., per cent	13.5
Reduction of area, per cent	27.0
Charpy impact—ft. lb.	37
Brinnell hardness avg.	282

The pinions were positioned for cutting by means of a chuck fixture on the gear hobber table and steadied at the top by the combination overarm steadyrest. A trial cut was made on a standard pinion of 160-190 Brinnell to check hob and machine performance. Four of the teeth of the Kennametal K-3H grade cemented carbide hob had been chipped in transit, and it was deemed necessary to determine whether this damage had weakened the braze bond between the carbide inserts and the steel backing strips. The sharp edges of the chipped areas were lightly relieved with a diamond hone to discourage further chipping, but no grinding was done on the radial cutting face, since it was not planned to cut an entire gear.

The machine was set at 133 r.p.m. (209 ft. per min. with 6 in. hub), 0.050 in. feed, 0.400 in. roughing depth and the hob set for climb hobbing. The first 3 to 4 in. of the cut gave good chip formation and surface finish. However, a ticking noise developed at this point that corresponded in frequency to the r.p.m. of the hob spindle and became a decided knock after cutting 7 in. At this point, the cut was discontinued.

Examination of the hob showed no further chipping, but did show slight loss of clearance on the tooth profile or pressure angle of several of the teeth, indicating lead variations from tooth to tooth over the cutting edges. A check given the hob on a universal hob measuring machine showed definitely that it was not within Class B tolerances for tooth form or size, and further, showed negative clearances behind some cutting edges. The lead variation from tooth to tooth over the cutting edges was as much as 0.006 in. in one case, and since the manufacturer of the hob reported no such inaccuracies, it can only be assumed that the steel backing strips carrying the carbide cutting edges shifted, due to the effect of atmospheric changes or mishandling. No means were available for correcting these inaccuracies so the hob was sharpened by grinding the radial cutting faces in order to continue the tests. A diamond wheel of 100 grit resinoid bond was used for rough sharpening, and the infeed of the diamond wheel was held to 0.0005 in. per pass and reduced to 0.0003 in. per pass after changing the wheel for a 220 grit one for finishing. A copious flow of kerosene was used and the wheel dressed frequently to keep the wheel free cutting and avoid grinding checks. The hob was finally prepared for the first test cut by lightly honing the cutting edges with a 220 grit hone to remove the "feather" edge.

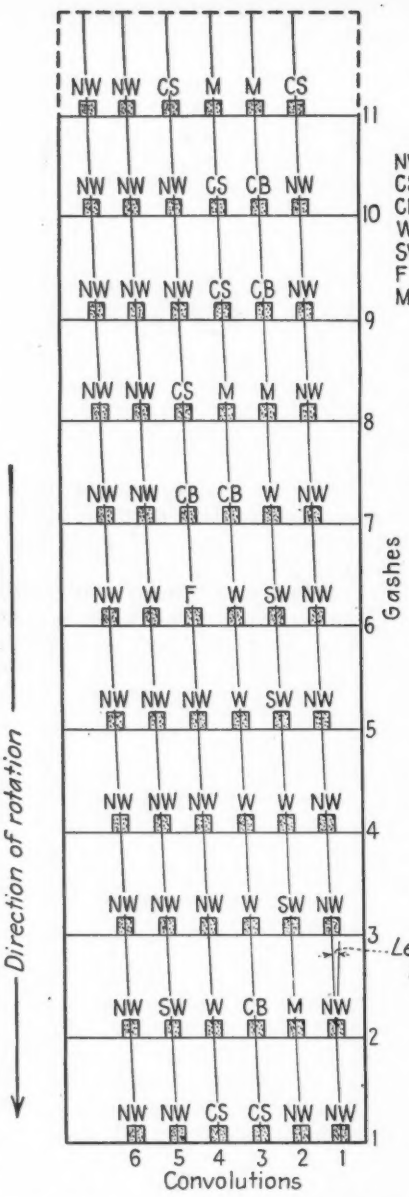

CHART showing condition of R.H. K3H grade carbide hob teeth after failure. Note the irregular condition of teeth in the same convolution, indicating possible high teeth.

o o o

A pinion of 282 Brinnell hardness was set up, and the machine operated at 133 r.p.m. (209 f.p.m. peripheral speed), 0.050 in. feed, 0.395 in. depth of cut with feed up and rotation of hob down (climb hobbing). The cutting action at first was very good; chips were formed clean and with only slight discolorization from the harder material; tooth finish was considered very good. Light smoking occurred due to the heavy sulphur base oil used.

A faint ticking noise was evident from the start of the cut and increased in intensity until it reached a definite knock at approximately 4½ in. At this point it was noticed that chatter marks began to show on one side of the gear teeth, and about 3 in. further, the chatter marks showed on both sides of the teeth. After cutting 14½ in., the knocking suddenly developed into one final loud click, then silence for 44 revolutions of the hob (as evidenced from the marks on the gear teeth) and then the machine stalled. It was agreed by all present that the stalling was the effect and not the cause of the hob failure. It was obvious from the start of the cut that the inaccuracies of the hob caused undue load on one or two of the teeth.

The machine stalled when the arbor jammed into the spindle after one or several of the teeth in the hob failed, causing a high side pressure. One tooth fractured badly, but remained on the hob, whereas five teeth actually came out. Four of these teeth were recovered from the chips but the fifth could not be found. Examination of the four teeth showed various degrees of wear; one appeared as though it had not cut at all, another chipped badly as though subjected to more than its share of the load, and all showed signs of loss of clearance on the pressure angle. The chart represents the position of the missing teeth and the condition of all the teeth after the test that resulted in the hob failure.

In preparation for the next test cut, the left hand helix of the 282 Brinnell pinion was positioned for cutting. It was desired to take a finish cut with the L.H. K-4H hob so a standard high speed steel hob was used for the roughing cut. It is interesting to note that the cutting action of the high speed steel hob on the 282 Brinnell pinion was very good, and resulted in less dulling of the hob than when used on pinions of standard hardness. The hob was run at 40 r.p.m. (45 f.p.m. peripheral speed), 0.030 in. feed and 0.395 in. depth of cut, which approximates standard cutting conditions. The improved performance is believed

due to the better machinability characteristics of the high Brinnell pinion, and to the improved operating condition of the modified machine.

Having rough cut the L.H. helix, the K-4H hob was set to take a 0.030 in. deep cut to simulate finish cutting. The sulphur base cutting oil was replaced with a straight mineral base oil or lower viscosity to improve the cooling effect at the higher hob speeds and eliminate the damaging effect of the sulphur to the carbide insert. The machine was geared to 174 r.p.m. (273 f.p.m.) and 0.090 in. feed. At this speed and feed the gear was cut in approximately 2 hr. as against the 23 hr. normally required when using standard high speed steel hobs at standard speeds and feeds. The chips came off clean and uncolored and the finish was agreed by all present to be excellent. The 0.090 in. feed marks were visible at the root of the teeth but the helix angle checked well within the allowable tolerance. The machine performed very well during this cut and all bearing temperatures stayed within a good operating range.

A second C-3 pinion of approximately 285 Brinnell was set on the machine; the L.H., K-4H hob was reset after grinding 0.005 in. off the radial face to resharpen. The hob was set to take a normal roughing depth of 0.400 in. and the machine geared to 174 r.p.m., 0.030 in. feed. This roughing cut was continued for about 7 in. and it was decided to stop the cut and adjust the speed to the maximum to continue the test.

The next 7 in. were cut at 224 r.p.m. (351 f.p.m.), and 0.030 in. feed. During the first 2 in. of the cut, the machine stalled due to lack of lubricating oil to one of the cast iron change gears in the feed box. Oil was manually applied and the test continued after examining the hob. It often happens that carbide tools are chipped or otherwise damaged when stalled in a cut with the feed on, but no damage resulted in this case.

During both of these later tests, the chips formed very well and no unusual noises developed in the machine. The bearings of the machine remained within their proper operating temperatures although machine temperatures were naturally higher than slow speed operation. Due to the high speed and light feed, the surface finish on the gear teeth was excellent. At 174 r.p.m. (273 f.p.m.) the hob showed little or no wear, but at the 224 r.p.m. (351 f.p.m.) a slight loss of clearance was evident on the tooth profile cutting edges. This would indicate that the best operating speed for cutting a 285 Brinnell pinion with carbides of the characteristics of Kennametal K-4H grade would fall between the 174 and 224 r.p.m. range, probably about 200 r.p.m., giving approximately 200 f.p.m., when using a 6 in. diameter hob.

The conclusions drawn from the entire test procedure and results indicate the following:

(a) Modified machines function entirely satisfactorily for carbide hobs and will show definite advantages even when using standard high speed hobs.

(b) High viscosity cutting oils with sulphur base should be replaced with straight mineral oil of low viscosity when using carbide hobs.

(c) Carbide hobs should have much heavier sections of carbide inserts and be mechanically clamped with brazing only as a secondary or safety measure. The hobs used had a 3/16 in. thick carbide insert brazed to a steel backing strip.

(d) Comparatively light feeds of 0.030-0.040 in. per rev. of the gear blank appear most satisfactory for roughing since less chipping results. This fact further indicates that the harder wear resistant grades of carbide will probably be used. Slight tapering of the first two rows of teeth will help relieve chipping action, However, this is only a minor concern on small gears or pinions.

(e) The accuracy of the hobs (roughing and finishing) to be used to continue these experiments will have to be kept within Class A tolerances and even greater emphasis placed on the quality of workmanship than required for high speed steel finishing hobs.

(f) Carbide hobs are entirely suitable for cutting harder materials than heretofore normally used for main propulsion gear blanks at speeds that will materially increase production.

It is now planned to continue the carbide hobbing test at a gear manufacturer's plant on the East Coast, and arrangements have been made to cut bull gears of 58½ in. diameter. The most rapid advancement can be made by close cooperation between the Navy and as many interested marine propulsion gear manufacturers as feasible. In this way, experience with carbide hobs will be widespread and the various gear manufacturers will continue to advance the use of such hobs in accordance with their particular needs. Certain design features of carbide hobs can and will be improved; chiefly, the method of positioning and holding the carbide cutting edges. Several new types of hobs are now being designed and as soon as those under contract with the Illinois Tool Works are completed and tested, it is planned to have additional hobs manufactured.

The Navy's goal remains: To develop carbide hobs to the point that the hobbing of marine propulsion gears of harder materials and smaller diameters can be accomplished on a well established production basis.

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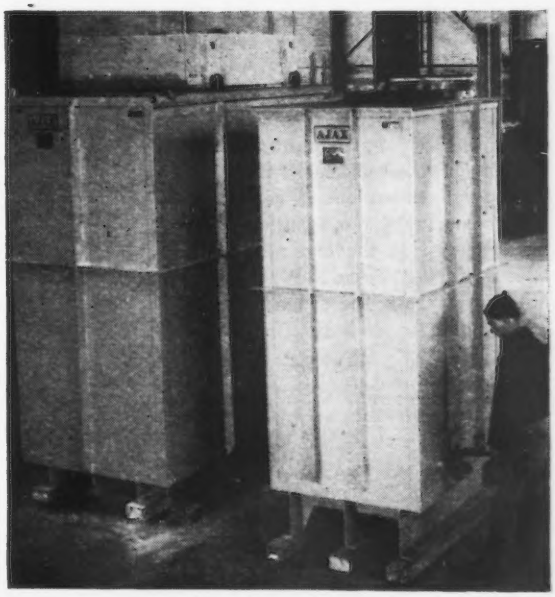

TWO Ajax-Hultgren electric salt bath furnaces, recently installed in a large midwestern plant for isothermal heat treatment of special ordnance parts, represent the deepest salt baths constructed to date. These furnaces have a salt depth of 7 ft. Both furnaces, austenizing (left) and quenching (right), are internally heated by closely spaced electrodes, which minimize local overheating and premature pot failures. Electromagnetic forces are developed by close electrode spacing, creating a vigorous stirring action which results in immediate circulation of heat and holds temperature variations throughout the bath to a maximum of 5 deg.

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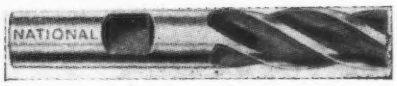
New Equipment . . .

Small Tools and Gages

. . . Recent developments in end mills, drills, fastening devices, fixtures and measuring instruments are described in the following pages.

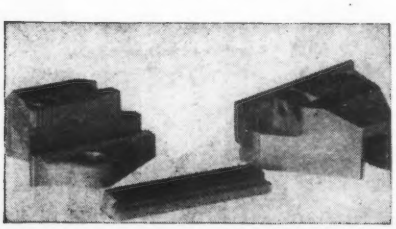
FAST spiral end mills designed for milling slots, keyways and pockets where the ordinary arbor type of miller cutter cannot be used has

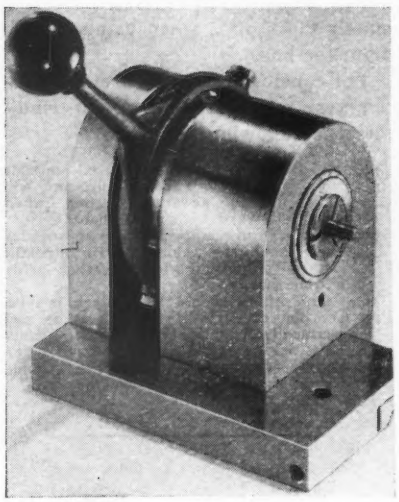


been announced by *National Twist Drill & Tool Co.*, Rochester, Mich. The high helix angle of the cutting edges and the free cutting construction of these Helex end mills are said to promote smooth, efficient operation even at high feeds and speeds. Operation at comparatively high speed is recommended to avoid feed overloads and consequent breakage. Made with Weldon shanks these tools are furnished in the following styles: Fast spiral double-end and single-end end mills; long and extra long, fast spiral end mills and small fast spiral double-end end mills, all in both multiple and two-flute styles.

Chaser & Chaser Holder

A CHASER and chaser holder combination has just been announced by *Landis Machine Co.*, Waynesboro, Pa. A rack tooth arrangement is used to locate the chaser in its approximate position. The chaser has rack teeth milled for its full length on the offset seating surface and rack teeth milled on the chaser clamp at the end nearest the chaser cutting edge. When interchanging chasers, the chaser is placed in the holder in its approximate position and clamped tightly. An adjusting screw which engages the back end of the chaser clamp is then used to advance the chaser and chaser clamp as a unit to the exact position. Elongated slots in the chaser clamp permit sufficient lateral movement of the clamp slightly greater than the pitch of the rack.



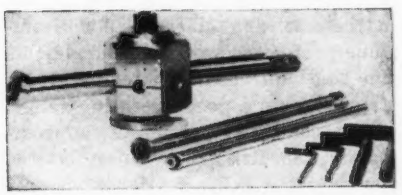


Collet Speed Chuck

A COLLET speed chuck developed especially to fit on a Sheffield grinder for grinding studs and other work to be held in a collet has been announced by *Zagar Tool, Inc.*, 23880 Lakeland Blvd., Cleveland 17. It is independent insofar as its own bearings and all of its collet closing mechanisms are concerned. Most of the collet closing mechanisms are standard parts of standard Zagar 1 in. collet fixtures. It embodies all the basic principles of the standard Zagar collet tool and in particular does not move lengthwise in opening and closing which is a very important feature in grinding to shoulder dimensions.

Tool Holder

A NEW type of boring and cutting tool holder for use with its circular Shearcutter boring and turning tools has been announced by



Shearcut Tool Co., Bellingham, Wash. The holder is made in fize sizes to accommodate lathes and screw machines from 10 to 36 in. swing. Each tool holder is furnished with three boring bars, one of which is arranged for turning in the smaller sizes, and is made to the toolmakers' precision and finish. The circular boring and turning tool gives from 20 to 50 new cutting edges simply by rotating to a new position on its holder until resharpening is necessary.

Sheet Metal Drill

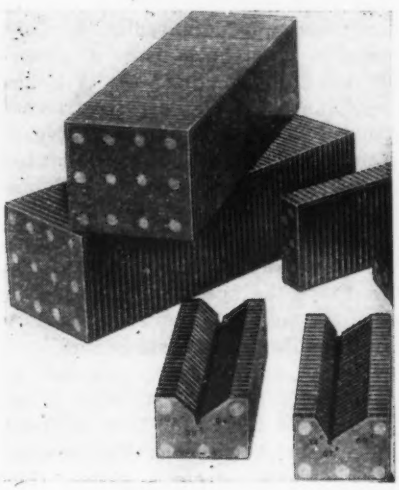
ESPECIALLY designed to mill and drill any sheet metal products or any form of plastic material, the Micro-King "Mill Drill" has been announced by *Steel Tools, Inc.*, 2307 Prospect Avenue, Cleveland 15. No lead holes are necessary. Holes are drilled in one operation. Drill sets are available in sizes from 1/16 to 2 in. The drills are sold in sets of 16 tools only.

Flat Ground Stock

NON-DEFORMING flat ground stock, called Air-Tru, has been announced by *Simonds Worden White Co.*, Dayton, Ohio. The stock is air hardening and is especially designed for applications where tolerances must be held through heat treating. The stock is supplied with a black oxide finish which inhibits rust from exposure and handling, reduces friction on sliding surfaces and will not flake, crack or chip. The finish is also said to permit scribing without the need of layout dye. It is available in rectangular pieces 18 in. long, widths from ¼ to 6 in. and in thicknesses from 1/64 to 1 in.

Holding Blocks

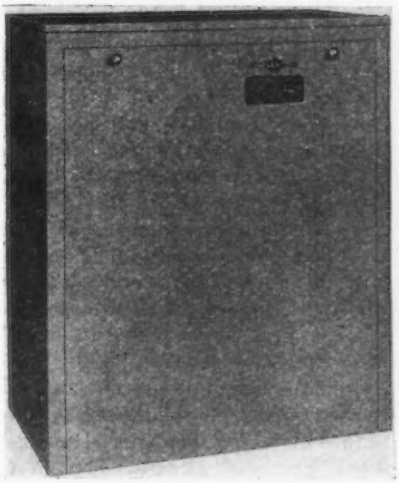
MANUFACTURE of special sizes, shapes and forms of their auxiliary holding blocks for magnetic chucks, called Magne-Blox,



have been announced by *George Scherr Co.*, 200 Lafayette Street, New York 12. The standard sizes of its Magne-Blox, laminated parallels, V Blox and Angle Irons can now be made to conform to the magnetic chuck spacings of any type chuck.

Coolant Temperature Control Unit

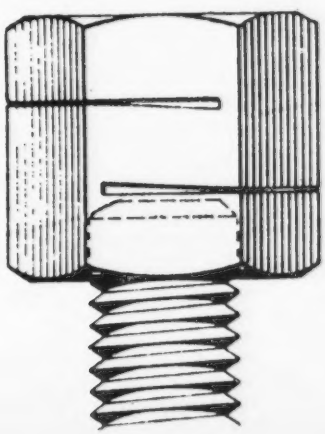
PACKAGED units which provide uniform temperature control of machine tool coolants and cutting oils have been announced by *Airtemp Div., Chrysler Corp.*, Dayton, Ohio. The units remove a constant volume of heat equal to that being generated, thus removing heat rapidly enough from the point of cut. The cooler consists of three shell and finned coil heat exchangers especially designed for the cooling of oil or coolant. Arranged in multiple, oil circulates through the exchangers in parallel,



thus reducing pressure drop to a minimum. A bulb type thermostat installed in the leaving oil line controls temperature of oil supplied to the machine tool oil sump. This thermostat also prevents overcooling of the oil. The motor is a 3 hp. squirrel cage induction motor type, oil cooled and hermetically sealed.

Self-Locking Nuts

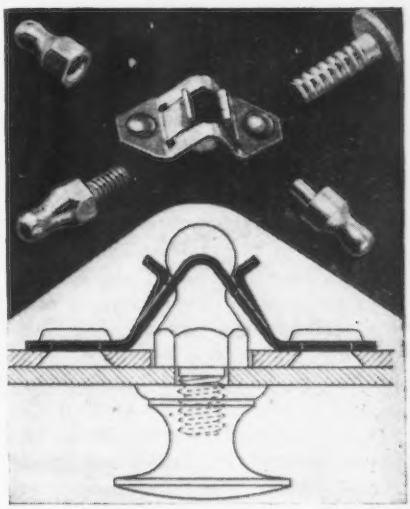
SUITABLE for all bolt and stud sizes and temperature conditions requiring easy and dependable assembly, the "Cling Nut" has been announced by *Beach Precision Parts Co.*, Second and Warren Streets, Harrison, N. J. Depending on the selected height of nut, two or four uniform slots are milled into opposite sides of the nut, parallel to the base surface. These slots only go as deep as the top of the thread surface beyond the bolt depth and divide the vertical height of the nut into 3, 5 or 7 equal sections. By application of directed, controlled pressure, the slots are closed sufficiently to attain the proper torque requirements. When



started on the bolt, about two whole threads can be run up easily by hand. The nut is reversible, giving identical results regardless of which end is started on the bolt.

Spring Steel Nut Latch

A SPRING steel nut latch, No. 1663, has been developed by *Tinnerman Products, Inc.*, 2040 Fulton Road, Cleveland 13. The spring arms of the "Speed Nut" snap over ball or grooved studs to provide firm attachment, yet studs can be quickly withdrawn. The nuts are available in five material thicknesses to provide the desired degree of pull-out tension. Three styles of ball studs are available, drilled and tapped for No. 6-32 screws, threaded shank and plain shank for riveting. These, as well as



the grooved stud, are provided in lengths to suit application requirements.

Splined Nut

A NEW Rivnut of the splined type suitable for use on wood, plastics, leather, hard rubber or other material where it is necessary to anchor a nut for attaching accessories has been announced by *B. F. Goodrich Co.*, Akron, Ohio. Splines beneath the countersunk head supply resistance to torque, while the bulge or upset which forms below the end of the splines furnishes the tension resistance. The splined nut is thus locked into place two ways. Internal threads left intact within the Rivnut shank take an attachment screw for installation of accessories. The splined nut can be installed with the same type tools regularly used for heading conventional type of nuts

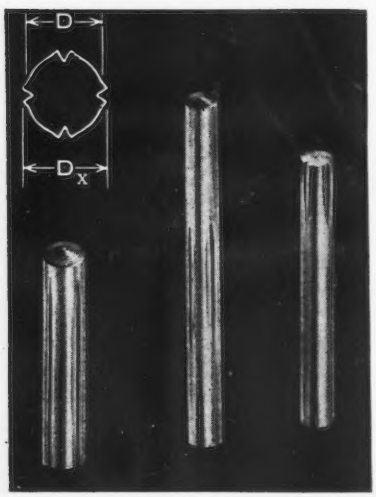
in metal. It is being made in sizes Nos. 6-32, 8-32 and 10-32 in aluminum or brass.

Ground Thread Socket Screws

GROUND thread socket set screws have been announced by *Parker-Kalon Corp.*, 194 Varick Street, New York 14. The ground thread set screw is said to be an improvement over the conventional socket set screw in finish and accuracy. The threads are ground on the new Landis centerless thread grinder from hardened blanks which increase accuracy. They are free from the nicks, burrs and hardening cracks common to cut threads. When enlarged in the comperator, the contour and lead of the ground threads are said to conform to standard with great accuracy. A uniform Class 3 fit is assured.

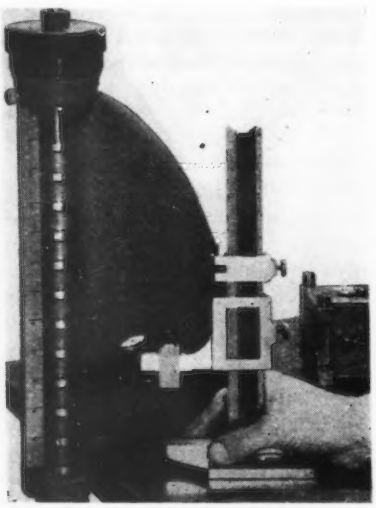
Self-Locking Taper Pins

A LINE of standard and special self-anchoring, vibration-proof pins have been announced by *Driv-Lok Pin Co.*, 565 West Washington Boulevard, Chicago. Pressed or driven into standard drilled holes, the pins have four flutes on the surface parallel to the axis. The raised, work-hardened edges of these flutes provide an expanded diameter of a few thousandths greater than the nominal diameter of the pin. The length and position of the flute can be controlled accurately so that the pin can easily be inserted. When the pin is inserted in a drilled hole, these raised edges are compressed inwardly, providing a resilient, self-locking element. They are available in sizes from 3/64 to ½ in. in diameter and from 3/16 to 4½ in. in length in any material and in a wide variety of types.



Height Gage

A HEIGHT gage for surface plate work has been announced by *Cadillac Gage Co.*, 20316 Hoover Road, Detroit 5. The Pla-Chek gage is guaranteed accurate from 0.00005 in. for any size from 0.001 to 12 in. from the surface of the plate. It is made from a hardened steel bar with 12 steps spaced exactly 1 in. apart with a micrometer screw thread ground on the lower end, a large micrometer thimble graduated in 0.0001 in. on the upper end of the bar and a simple triangular shaped support bracket. When checking work on the surface plate, the micrometer thimble of the gage is set at zero. The lower end of the bar and the surface plate are then exactly level. The micrometer is set for the desired dimension in thousands and tens of thousandths. The measurement is taken from the desired inch step.



Abrasive Wheel Grader

FOR grading abrasives, a comparator has been announced by *Hanchett Mfg. Co.*, Big Rapids, Mich. A diamond or special alloy steel grading tool oscillating under a given load gradually penetrates the grinding wheel or other material to be graded. The number of oscillations is predetermined for each material, based on comparative tests made on wheels, hones or material previously proven satisfactory. When the instrument completes its specified number of oscillations, the grading tool records the depth of penetration within 0.001 in. on an indicator. Grinding wheels of the exact same hardness and bond structure are automatically classified and segregated by degree of hardness and their production performance is predetermined scientifically. Maximum work height is 6 in. Larger sizes are also available.

Stiffness Gage

FOR determining standard measurements of the stiffness and resilient qualities of flexible materials up to ⅛ in. in thickness, such as laminated plastic, cardboard, light metallic sheet and wire, a power-driven stiffness gage, the V-5 has been announced by *Taber Instrument Corp.*, 111 Goundry Street, North Tonawanda, N. Y. The calibrated weighing system is of the pendulum type, and the face of the specimen clamp is mounted exactly on the center of rotation insuring constant test length of the specimen, resulting in accurate and comparable test data. A set of calibrated weights is furnished with the instrument, calibrated in 500, 1000 and 2000 stiffness units. Weights of 3000 and 5000 stiffness units are also available. For measuring the flexual strength of very thin and flexible materials below 10 units stiffness an attachment is provided that eliminates mechanical friction and inertia.

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C Condensers
Conveyor Rolls

D Display Stands
Drying Machines

Electrical Equipment
E Elevator Parts
Exhaust Tubes

Ferrules
Floor Scrubbing Machines
F Food Processing
Furniture

G Gravity Carrier Systems
Grease Guns

Handles
Hardware Items
H Heat Exchangers
Hydraulic Hoists

I Irrigation Lines

Ladders
Lamps
L Laundry Machinery
Lawn Mower Parts
Lubricating Systems

Meter Parts
M Motorcycles
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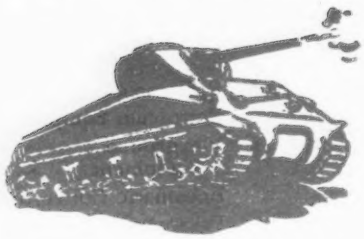
Assembly Line . . .

STANLEY H. BRAMS

• Cutbacks on military trucks are increasing, and remainder of 1945 will see output at low ebb . . . Outlook is better, therefore, for civilian vehicles . . . Auto sheets still hard to locate.



DETROIT — Production of military trucks, a dependable mainstay of the auto industry's military program since well before the war, is on a sharp downgrade. After four years of constant truck procurement, during which the industry produced some $7 billion in military motor vehicles, requirements of the services are being slashed right and left.

Against original projections of about 625,000 military vehicles for this year, the total was reduced to about 550,000. Cutbacks now going forward will further reduce this total to no more than 400,000 vehicles.

By the end of the first half of this year, probably close to 300,000 of those will have been completed, so only 100,000 remain to be done during the second half—a comparative handful. As soon as the current cutbacks, aggregating around $370,000,000, are received by the producers and put into effect, the military truck program will be a minor issue.

The largest cutback thus far sent to any manufacturer has been for $100,000,000 in 2½-ton trucks to be built for lend-lease Russian use by Studebaker Corp. This job, terminated by Army Ordnance, called for production of 44,000 trucks between Aug. 1 and July 1, 1946. It affected about 5000 workers and 429 subcontractors. Studebaker was one of the major producers of 6 x 6 trucks, having built 200,000 of them for military purposes.

Reo's 2½-ton contract, comparatively minor alongside of Studebaker's, was also terminated as of June 30. Another big name in this theatre of manufacturing operations involved in cutbacks thus far made public is Dodge, whose ¾-ton weapon carrier contract will be partially terminated as of July 7.

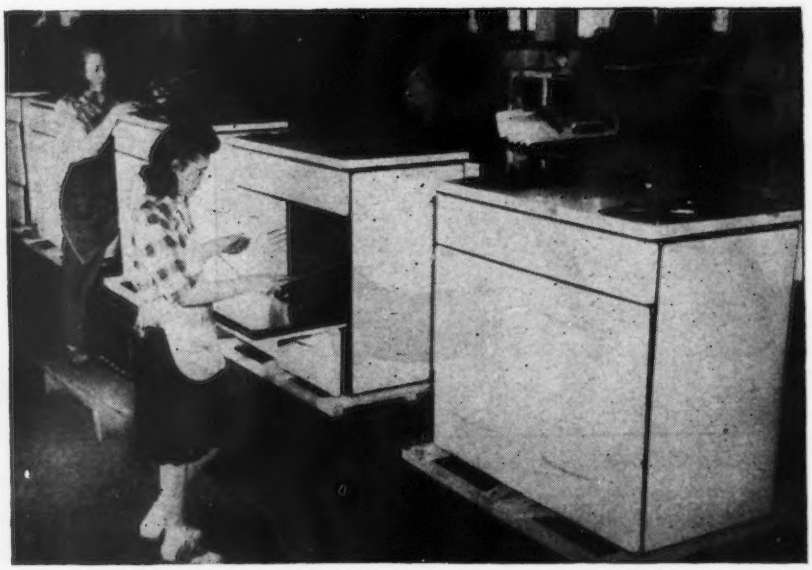
The largest medium-heavy truck producer, GMC Truck, is expected to be involved in cutbacks not yet completed. Cargo body work is reportedly being reduced already by this producer, and with the total truck cutbacks as large as they are promised, it seems inevitable that suspensions will come to GMC.

Plans are being developed for the Foreign Economic Administration, already the purchaser of approximately 60,000 trucks out of this year's civilian schedules, to take over parts and inventories on hand in the manufacturing establishments, and perhaps to continue the manufacture of incompleted contracts until such inventories run out.

THESE cutbacks have wide ramifications on the general automotive picture. For one thing, relief of the drain on heavy truck tires certainly brightens the constantly improving outlook for passenger car casings. For another thing, it would seem to make more certain the production of the 188,700 vehicles authorized for civilian use during the last half of this year in addition to the 245,444 originally allocated.

Of the initial production quota, 233,472 units have been placed among specific truck manufacturers. The largest allotments are as follows: Chevrolet, 62,312; Ford, 53,837; International Harvester, 32,686; Dodge, 21,774; GMC Truck & Coach, 17,879; White, 9304; Mack, 6870; Diamond T, 4971; Reo, 4258; Autocar, 4052; Studebaker, 4000; Federal, 3178; Brockway, 2220, and Divco, 1712. Chevrolet and Ford are the dominant producers in the lightweight range; Chevrolet, Ford, International and Dodge in the medium weight; International in the light-heavy group, and Autocar, Mack and GMC in the heavy classification. To the totals of these companies and smaller firms will be added forthcoming allocations for the 188,700 additional vehicles. Probably these allocations will be made on the same historical basis effective in the past, but manufacturers with capacity to exceed their shares of the historical

CIVILIAN GOODS ON THE WAY: *At the Detroit-Michigan Stove Co., some civilian manufacture has been resumed, although full production is still some distance off. Gas cooking stoves are among the first items to start rolling off the assembly line.*



Put your Tooling Problems in Our Lap!

Tooling is a tough problem. *But dealing with it is our business.*

Time after time, Pratt & Whitney engineers have been able to "de-kink" knots in production lines that looked hopeless.

Today, as the war swings into its secondary and final phase, next to on-time delivery of all war needs come thousands of reconversion problems that must be solved — *and fast!* As time goes on, these will become more and more urgent.

Our engineers are ready to work elbow-to-elbow with you the minute you say the word. Their experience and knowledge can go far toward helping you smooth out the rough spots and gear your set-up to the new production you are planning.

In the catalogs and other literature on our big line of machine tools, small tools, and gages are many helpful ideas and facts which you may not have had time to consider. Ask us to send you this material. And by all means, call in Pratt & Whitney engineers right at the start. It's *their* business to know *your* troubles. And just as P&W products are famed for their precision, P&W engineers are precision-minded concerning your tooling problems.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

basis probably will be permitted to do so, but will not receive any priority assistance.

In other direction, the military truck cutbacks may be of some aid in relieving the currently tight sheet picture. With automobile companies clamoring at the doors of the steel mills for shipments of deep drawing sheet starting July 2—the first working day after go-aheads on automobile production are sanctioned—none is in immediate sight beyond what may be made available from mill book space opened up by cancellations. The truck program shrinkage may open up sheet facilities of at least fair importance in relation to present rather small automotive requirements, provided this space can be held open for civilian goods production.

PRESSURE for these deliveries is really terrific in Detroit steel offices. Apparently without exception, the automobile companies are demanding best possible treatment from each of the mills with which they do business, or in some cases outright preference over others. None of the major steel companies is yet able to meet the automotive demands for early sheet shipments, however.

• • • The latest in the long series of top bracket changes in the automobile industry came last week when the two Crusoe brothers resigned from Fisher Body Division of General Motors.

Claude A. Crusoe, director of purchases for the division had been with Fisher for 36 years. Lewis D. Crusoe, divisional comptroller, was a 31 year veteran. The new director of purchases is Roy C. Miller, former assistant to Claude Crusoe. M. E. Sheppard, former assistant comptroller, succeeds L. D. Crusoe.

Delivery promises on alloy steel requirements are fairly satisfactory for all automobile companies, and there is no complaint on this score. But, due to the apparent unavailability of sheet, particularly wide sheet, belief is being expressed that early models may be seam welded on their tops and perhaps even on fender crowns. It is generally believed that somehow the automobile companies will obtain their sheet requirements when the time arrives, but how this can be done within the law is something at present baffling practically every steel office in Detroit.

Meanwhile, the Automotive Council, having surveyed its membership, reported that the most important shortages they have been able to uncover are in stainless and ordinary carbon steel, zinc, nickel and chromium. Lack of nickel and chrome for civilian applications is creating uneasiness in many companies over the amount of bright work to appear on 1946 models.

The council also complained against the OWMR regulation affecting Group I and Group II labor shortage areas, compelling manufacturers to get WMC approval before increasing production above the level prevailing in the last 1944 quarter. Inasmuch as some automobile plants are located in areas still classified in the I and II labor area brackets, these firms are unable to go ahead with civilian production until they file a great mass of statistical data not immediately available.

•

Detroit Strike Over

Detroit

• • • A mysterious weekend strike at the mills of Great Lakes Steel Co. ended late Sunday shutting down production on the open hearths, the blast furnaces at Hanna Furnace Co. and the fabricating plants of Michigan Steel Co. about 8000 men were involved.

The strike broke out Friday afternoon without any notice of grievance being served the company. Officials of the CIO United Steel Workers Union refused to state why the walkout took place. The presence of picket lines and the simultaneous stoppage, however, indicated clearly that the strike was authorized.

Late Sunday afternoon the strike ended as suddenly as it had begun. workers went back into the mills and operations resumed. Somewhere around 10,000 ingot tons of steel, largely sheets and plates, were lost out of military schedule.

•

Metal Treating Group Formed

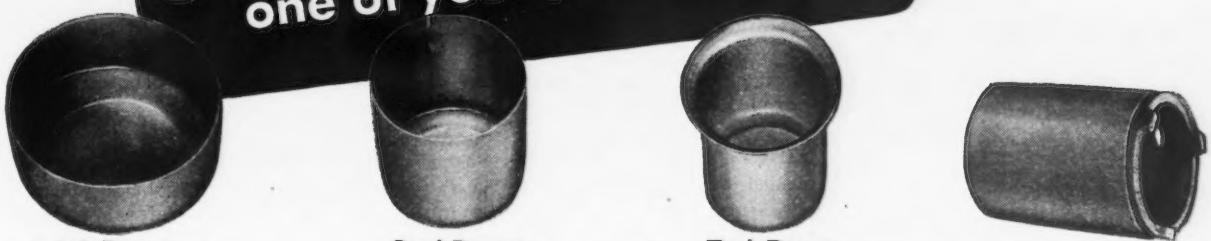
Detroit

• • • The Michigan Chapter of the Metal Treating Institute has been organized with Ralph Hoensheid of Commercial Steel Treating Corp. as chairman. Other officers elected are:

Vice-chairman, Roland Starr, Starr Heat Treating Co.; secretary, Clark Oldenburg, Commercial Industrial Corp., and treasurer, Robert Rouse, Acme Steel Treating Co.

CIVILIAN IRONERS: *First electric ironers to be produced since* 1942 *come off the line at Hurley Machine Division of Electric Household Utilities Corp., Chicago, with top officials in attendance. Left to right: E. N. Hurley, chairman of the board; H. C. Buckingham, treasurer; Frank J. Simpson, vice-president; Ralph M. Richmond, vice-president; Raymond J. Healy, secretary; Walter Oberst, vice-president and general manager, Meadows Division; Owen G. Nugent, manager, Eastern Division. The first* 50 *ironers were shipped by air express as prizes for war bond salesmen.*

is deep drawing *Stainless Parts* one of your problems?



1st Draw
Diameter $4\frac{3}{32}$"
Depth $2\frac{1}{16}$"

2nd Draw
Diameter $3\frac{1}{16}$"
Depth $3\frac{3}{16}$"

3rd Draw
Diameter $2\frac{15}{32}$"
Depth $3\frac{7}{16}$"

Finished Bucket

Deep drawing Stainless parts is easier when you select a uniform, ductile Stainless Strip. The job shown above is a typical example of the good results you can obtain with easy-working Carpenter Stainless Strip.

It's a steam trap bucket, the main duty of which is to eliminate condensate and entrained air from steam lines. The buckets must withstand corrosion from all types of water found throughout the country and operate in temperature ranges up to 750°F.

The manufacturer needed a metal that would provide these heat and corrosion resistant properties, yet deep-draw easily to a cup depth of $3\frac{1}{2}$".

Carpenter Stainless No. 4-A (Type 304) used in $6\frac{3}{4}$" x .026" coils, solved the problem on both counts. In addition, it provided extra bonuses. The consistent uniformity of Carpenter Stainless Strip, lot after lot, kept rejects to a minimum, cut die wear and speeded output of the parts.

Do you have a job involving deep-drawing or other forming operations with Stainless Steel? If so, get in touch with us. Take full advantage of your nearby Carpenter representative's diversified Stainless experience now. Call him in today or write us at the mill.

Here's a 98-page book that contains the answers to your questions on selecting and fabricating Stainless Steels. Send for your copy of "Working Data for Carpenter Stainless Steels". A note on your company letterhead, indicating your title, is all that's necessary.

The Carpenter Steel Company • 121 W. Bern Street • Reading, Pa.

Carpenter STAINLESS STEELS

...for
Strength
Rigidity
Heat Resistance
Corrosion Resistance
Longer Product Life
Sales Appeal

BRANCHES AT
Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, St. Louis

Washington . . . L. W. MOFFETT

• Scrap returns from Europe remain very small . . . No definite plans to expand shipments . . . Ordnance redeployment under way.

WASHINGTON — Incoming quantities of scrap from the broad European theater of war, strewn with great areas of wrecked military equipment and structures, is only a dribble of the potential supply. In April they amounted to 16,470 tons and in May rose to 22,213 tons, while in the first 10 days in June they were only 1338 tons. Just what quantities may be recovered is something that even those associated with the salvaging operations do not know. They only know that war's destruction has been of staggering proportions and that it has left an immense volume of material, once high-priced and often of the finest mechanical precision, that now can be used only to charge furnaces, then converted into new forms—tools of peace, it is hoped.

Just now the restricted movement of scrap from Europe is due to the shipping situation. Preference for ship space naturally is given to troops and material going to the Pacific area. It is logical to assume that, after this immense job has been eased and finally completed, much larger scrap supplies will be sent from Europe. There is no way of knowing at this time what such tonnages will be. But compared with the amount that is to be recovered, they will be small. There are several limiting factors. The domestic supply situation and demands, costs and availability of ships, probably will be among the controlling elements.

The outstanding limitation on shipments to the United States, however, will be the use of the scrap for rehabilitation work in devastated countries.

Under the present procedure all European scrap salvaged from theaters of war is allocated by the Allied Combined Raw Materials Board, headed by William L. Batt. So far allocations have been made to only three countries, Italy, France and Belgium. While requests for scrap have been made by neutral countries they have been denied and present plans do not contemplate supplying them with old material. Nor is there any plan to put the scrap on the open market abroad.

The shipments to this country are being sent by the Army at the request of WPB and consist of ferrous carbon scrap ⅜ in. and over, together with small quantities of brass, copper and other non-ferrous metals.

A future development in the war scrap situation relates to sales that will be made through the Army and Navy Liquidation Commission which is just completing its organization. It has made no sales as yet. Its authority is extended only to sales of scrap after it has been declared by the Army and Navy.

* * *

Some of the salvage work in the European theater is being done in connection with one of the toughest jobs ever faced by Army Ordnance, now under way. It relates to the receiving, inspecting, repairing, packaging and documenting well over 3,000,000 major items of ordnance equipment and approximately 700,000 tons of ammunition. These battle supplies are to be shipped to other theaters. Inevitably out of this enormous volume of equipment some will have to be junked.

The task, known as the Redeployment Program, involves the shipment of about 35,000 combat vehicles, 325,000 general and special purpose vehicles, 11,000 artillery pieces, 2,800,000 small arms, automatic weapons and mortars, 400,000 items of anti-aircraft fire control equipment and

USS FRANKLIN ROOSEVELT: *The new* 45,000-*ton aircraft carrier* Franklin D. Roosevelt *is being rushed to completion at the New York Navy Yard, Brooklyn. The keel of the ship was laid Dec.* 1, 1943, *and launched April* 29, 1945.

For hearth and slag line maintenance, open hearth men like Magnefer, the well-known, standard clinkered dolomite, so uniform in sizing and unexcelled in performance.

FIRST HELPER FOR LOWER HEARTH MAINTENANCE

HOW can open hearth "delay time" be reduced—now that furnaces are so pushed, month after month, at capacity operation?

The answer lies in the policy of using the best refractories available and in efforts constantly to improve refractory practice.

We supply basic refractories that support such a policy... refractories carefully designed and accurately controlled in manufacture to have desirable physical, chemical and mineralogical properties which enable them to meet severe furnace conditions.

The greatest plus value in Basic Refractories products, however, is that they are sold and serviced by representatives who intimately know steel making. "Basic" Sales Engineers are practical steel men, with years of experience making steel. This experience they supplement with a sound knowledge of basic refractories. Often they are able to offer suggestions which help solve tough problems, and so improve refractory practice—in slag line maintenance, in bottom repair, in new hearth construction.

So think of the "Basic" Sales Engineer as your "First Helper" for lower hearth maintenance costs. Use his knowledge and experience freely, to insure that the dependable basic refractories you get from him are yielding the best possible results.

BASIC REFRACTORIES, INCORPORATED 845 HANNA BUILDING *Cleveland 15, Ohio*

thousands of tons of ammunition. The program is under the general direction of Maj. Gen. Henry B. Sayler, Chief Ordnance Officer, European Theater of Operations.

There are two chief procedures by which equipment will be shipped to other theaters. The first applies to troops who will be shipped from Europe with their complete equipment direct to active theaters. This, however, represents only part of the problem. The second procedure for units returning to the United States calls for the surrender of their equipment at about a dozen collecting points where it will either be packaged and sent direct to other theaters if serviceable, or if repairable, put into combat condition and finally packaged for overseas shipment. The scrap will come from equipment that is beyond repair.

Redeployment processing of weapons and vehicles requires 20 ordnance shops for the repairing and packaging of combat vehicles, artillery, small arms and the like, for the repair, disassembly and crating of general purpose vehicles. In addition, there are nine depot and vehicle parks and nine ammunition depots. This does not include the installations necessary for the supply and maintenance of ordnance equipment used by American and other troops of occupation.

It is estimated that the program will be completed in approximately one year and require the work of 150,000 officers, enlisted men, civilians and prisoners of war for ordnance items alone.

* * *

Army-Navy Liquidation Commissioner Thomas B. McCabe has announced that James E. Knowlson, Chicago, and key personnel of his staff have arrived in the European Theater of Operations to make an advance survey and lay the groundwork for the ultimate disposal of all Army and Navy surplus in ETO. Mr. McCabe said that their trip at this time might be described as largely exploratory.

The party, consisting of approximately 20 persons, including Army, Navy and civilian personnel, Mr. McCabe stated, will separate in London, a group staying there and the remainder proceeding to Paris. They will also survey surplus material in other sections of ETO.

Accompanying Mr. Knowlson as his Deputy Commissioner is Conrad H. Matthiessen, Pasadena, Calif., and Brig. Gen. William R. Gruber, Cincinnati and Washington, who will serve as his Assistant Central Field Commissioner.

Mr. Matthiessen, former Assistant to the President of the Hawaiian Pineapple Co., came to Washington in January, 1941, as Deputy Director, WPB Priorities Division, serving there until January, 1943, when he became Deputy Director, Materiels Division and later Chief of the Bureau of Priorities and Deputy Director General for Operations. He left WPB in November, 1942, to return to California, where he served as a consultant until June, 1943, during this period establishing a WPB office in Hawaii. In 1943, he resumed his duties with the Hawaiian Pineapple Co.

General Gruber was recently transferred from the Southwest Pacific, where he was artillery commander of the 24th Division in the New Guinea, Leyte and Mindora campaigns. In 1942 he was with General Stilwell in Burma and China.

•

Fasteners to Reappear

Washington

• • • **Pre-Pearl Harbor** slide fasteners, hooks and eyes, snaps, buckles and kindred closure items are about to make their appearance.

Under a **metal exchange program,** announced by WPB, these products that are now made of steel and aluminum will be manufactured from copper base alloy. This has been made possible by the revocation on May 12 of Order M-9-C, which prohibited the use of copper and copper base alloys for civilian uses.

The metal exchange program, which terminates June 23, will be directed by the OCR which will act as metals banker. It will accept steel already allocated to manufacturers of CMP Code 622 in exchange for copper base alloy on a pound for pound basis. Aluminum will be exchanged on the basis of three pounds of copper for each pound of aluminum.

•

Direction 6 to PR-1 Amended

Washington

• • • **By amending** Direction 6 to PR-1 on June 15, WPB said that maintenance, repair and operating supplies obtained under Direction 25 (MRO for conversion to new products) to CMP Regulation 5 or obtained without priorities assistance are included in items exempted from the inventory limitation of PR-1. The amended direction further states that inventory restrictions of PR-1 do not prohibit delivery or acceptance of such MRO Items.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

YOU BET YOUR OLD JOB'S WAITIN' FOR YOU! BOY, YOU'VE BEEN DOIN' THINGS SINCE YOU BEEN GONE! WHAT'S THAT'N FOR? AN' THAT'N AN' THIS'N AN'--
IT'S A SHAME THAT A GUY HAS TO GO THROUGH SO MUCH TO WIN ALL OF THEM DECORATIONS, THEN PUTS 'EM AWAY IN A BUREAU DRAWER FOR ALL TH' REST OF HIS LIFE!
I THINK THEM KINDA FELLERS WOULD SOONER DO THAT THAN HAVE TO WEAR 'EM ALL THEIR LIVES, EXPLAININ' ALL ABOUT 'EM TO EVERY NOSY PARTY THAT HE MEETS!
THE HERO
6-21
J.R.WILLIAMS
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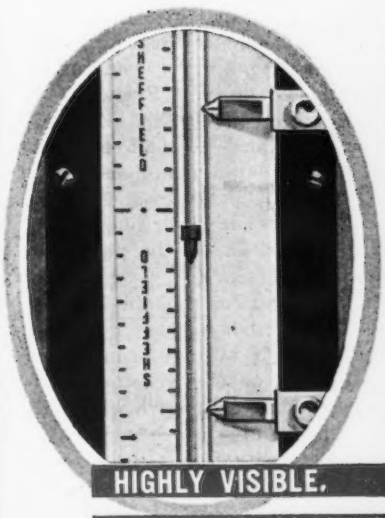
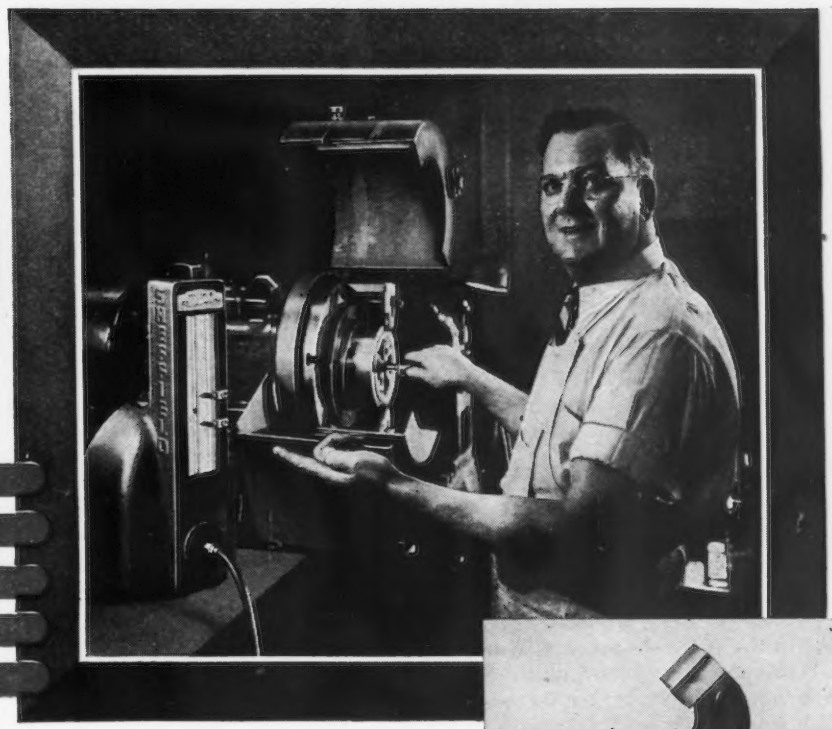
"THE *Float shows me* WHERE I AM!"



HIGHLY VISIBLE.
INSTANTANEOUS
POSITIVE
EASIEST TO READ
NO PARALAX



"There's no guesswork about my job—and darned little scrap! I check every piece, starting with the first, right at the machine—and fast, too! The float tells me where I am—whether or not I am doing a good job and whether the machine and the tools are working okay. If something goes wrong, the float tells me, and adjustments are made right away before any amount of scrap is run."

Sheffield Precisionaires are helping thousands of machine operators to do "tough" jobs without realizing they're tough. High amplification combined with an easy-to-see float that "shows where you are" greatly simplifies the job. Scrap, rework and lost time are substantially reduced—production and assembly are increased in quantity and in quality.

"Chek with Sheffield" as to whether the use of Precisionaires at the machine will make your tough jobs easier.

May we send engineering data . . . and have our representative actually demonstrate the PRECISIONAIRE to you?

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

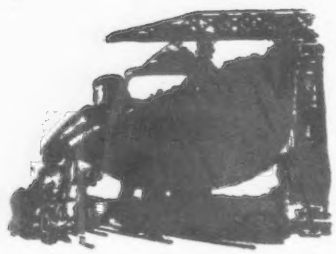
SHEFFIELD MASTER CRAFTSMEN

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

West Coast . . .

OSGOOD MURDOCK

• Entire board of SWPC governors resigns in protest to centralized direction and possible political influence . . . Bay foundries to abandon staggered vacations . . . New dams for Columbia River.



SAN FRANCISCO—Smaller War Plants Corp. celebrated its third birthday last week like the orphaned waifs of India—in this city at least—with "No Poppie, No Mommie" to guide it. Principal guest at the phantom celebration was a former football coach and one-time head of an ill-fated Bay Area race track.

The local office of the SWPC was until recent weeks thought to be one of the soundest and best directed of the branches of this agency in the country. Regional board of governors had comprised some of the best known and most respected businessmen in the West including Walter A. Haas, Levi Strauss & Co.; R. E. Fisher, Pacific Gas & Electric Co.; W. H. Thompson, Anglo-Calif. National Bank; R. J. Elkus, Mangrum, Holbrook & Elkus; Weller Noble, Pacific Guano Co.; D. J. Rust, Rylock Co.; Roland Tognazzini, Union Sugar Co., and C. S. Davis, The White House, none of whom saw fit to attend any possible ceremonies as they had recently simultaneously resigned as regional governors.

Occasion for the mass resignation had been the imminent appointment of Morton Harrison, Southwest regional SWPC director and a native of Oklahoma, to head this regional office. Reason for the resignations was not California's surfeit of Oklahomans, but instead strong convictions on the subject of SWPC management policy.

In the considered judgment of the aforementioned western industrialists policies of the SWPC were best administered by local men with an intimate understanding of local problems and conditions. Maury Maverick, of Texas, national chairman of SWPC, sent Mr. Harrison out to California ostensibly to consult with regional authorities, but, according to informed sources, actually to succeed Col. A. E. Howse. Col. Howse had been chief of special service for the AAF at Wright Field and had participated in the organization of their system of procurement, inspection and delivery. He was considered by the local governors eminently qualified for the position but had been redrafted by the Surplus Property Board as executive director and had resigned in February of this year.

Addition to the San Francisco office of a director whose chief qualification was a familiarity with the problems of Oklahomans and Texans, controlled by a tight Texas rein in Washington was not considered an asset by the existing board of governors.

* * *

LOCAL SWPC offices maintain that the action was due to a misapprehension. Subsequently, at the behest of SWPC director Patrick McDonough, president of the McDonough Steel Co., and chairman of the Alameda County Democratic Central Committee, a new consultant was retained by the San Francisco regional office, Ed "Slip" Madigan, former St. Mary's football coach who was retained at a per diem rate of $25, and, it is understood, $10 daily travel expenses to cover his personal transportation across the San Francisco Bay bridge.

The resignations remain in force, and the birthday was celebrated without benefit of the former board of governors or any subsequent appointees during a time when the best brains in the area are being devoted to the preservation of industry in the West.

* * *

BAY REGION foundries are inaugurating a new policy for workmen's vacations this year with Enterprise Engineering & Foundry leading the way with a complete foundry shutdown. This policy is a result of the newly signed labor contract with the Molders and Foundrymen's Local 164, and is hoped to be an answer to the confusion and inefficiency resulting from an effort to run a foundry with staggered vacations. Macaule Foundry is understood to be about to follow suit and other foundries are expected to fall in line.

* * *

Joshua Hendy Iron Works, which created a minor stir in the diesel business with a fabricated steel, all

OBSOLETE TOOLING: *An aerial view of part of the seven acres of A-20 tooling now in storage at the former Culver City Dog Track on West Washington Boulevard, Los Angeles, which will be sold as scrap. The tooling consists of jigs, fixtures, dies, templets and special tools.*

CURE FOR BAD TEMPERS

Soften the Hard Spots

... Eliminate Tool Breakage with the TOCCOTRON

NASH-KELVINATOR, Aircraft Engine Division offers this suggestion to shop executives who are vexed with the tool-breakage bogey.

Anneal the portion of the part to be machined. Do this by TOCCO Induction Heating. This localized annealing does not disturb the hardness of other portions of the part. Results for a number of their aircraft engine parts: breakage of expensive broaching tools and resultant delays are now nil. The gear illustrated, for example.

Leakage of the carburizing gas through the copper-plating on the inner surface resulted in hard spots when whole piece was carburized and hardened. When splines were cut, tools often broke.

Now . . . that area for a depth of .025-.040 inch is heated to 900-1000° F. with a 20 K.W. TOCCOTRON. Heating time is 2 seconds. The part is then cooled by an integral quench to facilitate handling. Total treating time per part is only 3.4 seconds. The uniformity of this localized induction heating assures perfect results on every part.

Find out how the new TOCCOTRON (Electronic Tube model) or TOCCO (Motor-Generator models) can help solve *your* problems of war production and postwar planning. "Results with TOCCO", Bul. 14, gratis.

THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio

TOCCO

INDUCTION

HARDENING, BRAZING

ANNEALING, HEATING

welded diesel motor, especially designed to withstand battle shock, has come out with a new line of motors of 190 to 250 hp., and has reverted to the industry tradition of cast iron.

* * *

Intriguing to San Francisco and Oakland industrialists is the recent report of Paul Scharrenburg, director of the Department of Industrial Relations showing that average wages in Los Angeles exceed those in San Francisco by $1.24 per week in the non-durable goods industries. Durable goods wages in the north still exceed those in the south by $5.85 a week. This figure includes a heavy share of high ship repair wage scale and overtime which is not paid in the south.

* * *

SEATTLE—In a bid for the ear of President Truman, Washington's Governor Mon C. Wallgren, former member of the Truman Investigation Committee, has appointed a new group of 15 representatives of industry, agriculture and labor to his new Division of Progress and Industry Development. Included on the committee are C. L. Egvedt, Boeing Aircraft; Frank McLaughlin, Puget Sound Power & Light Corp.; Evan Oscarson, Spokane mining man; Dave Beck, Seattle Teamster's Union, AFL; Roy Atkinson, Seattle regional CIO director, and Wylie Hemphill, Association of Washington Industries. The work of the committee will be done in cooperation with Art Garton, director of the Department of Conservation and Development.

* * *

"Fish are worth more than kilowatts" say the Pacific Northwest fishermen, while the U. S. Corps of Army Engineers proceed quietly with surveys intended to extend the Northwest's vast hydro-electric and irrigation system on the Columbia River.

Most advanced studies are those in preparation for the construction of a dam at Foster Creek, 51 miles downstream from Grand Coulee. Surveys of this site are about 80 per cent complete and a comprehensive report of the site's possibilities will be submitted to Washington, D. C., in August. A concrete gravity type dam is contemplated, 225 ft. high and 1300 ft. wide which would create a reservoir of about 425,000 acre-feet with an electric power output of from 600,000 to 800,000 kilowatts. Results of the Army Engineers' two-year study are said to put the Foster Creek Dam in the "definitely possible" category and is one of 24 other possible dams in this area. Nisqually has just received WPB permission for the construction of a $23,000,000 power house.

* * *

Bonneville power administration claims to justify its existence by accumulating a net surplus of $14.5 millions on an annual gross running at the rate of $23 millions now totaling gross receipts of $62 millions. D. L. Marlett, assistant Bonneville Power administrator, has announced that Bonneville will repay "every dollar of federal investment on the Columbia River."

Cited for Awards

• • • **The following companies have** received awards for outstanding war production:

Navy "E"

Farrel-Birmingham Co., Inc., plants in Ansonia and Darby, Conn., and Buffalo, N. Y. (fifth star)

Army-Navy "E"

Torrington Co., Bantam Bearings Division, South Bend, Ind. (fourth star)
Vita-Var Corp., Newark, N. J. (first star)
American Fabrics Co., Inc., Kansas City, Mo.
Atwood Vacuum Machine Co., Rockford, Ill.
Bulova Watch Co., Fuze Division, Philadelphia.
Cape Ann Mfg. Co., Gloucester, Mass.
Harry Darby, Kansas City, Kan.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
General Armature Corp., Lock Haven, Pa.
General Aviation Equipment Co., Metallic Link Division, Wilkes-Barre, Pa.
General Outdoor Advertising Co., War Contract Division, Jacksonville, Fla.
Rubin Grais & Sons, Chicago.
Haloid Co., Rochester, N. Y.
Heywood-Wakefield Co., Lloyd Mfg. Co., Menominee, Mich.
James C. Heintz Co., Cleveland.
Howell Co., St. Charles, Ill.
Lake Erie Engineering Corp., Kenmore, N. Y.
Limerick Yarn Mills, Manchester, N. H.
Miller Lumber Co., Kalamazoo, Mich.
Morgan Construction Co., Worcester, Mass.
National Roll & Foundry Co., Avonmore, Pa.
Nobiitt Sparks Industries, Inc., Orinoco Division, Columbus, Ind.
Pitt Engineering Co., Chicago.
Scott & Fetzer Co., Cleveland.
Sunlite Mfg. Co., Milwaukee.
U. S. Radiator Corp., West Newton, Pa.
Varsity Mfg. Co., Springfield, Mass.
Warren Co., Inc., Atlanta, Ga.

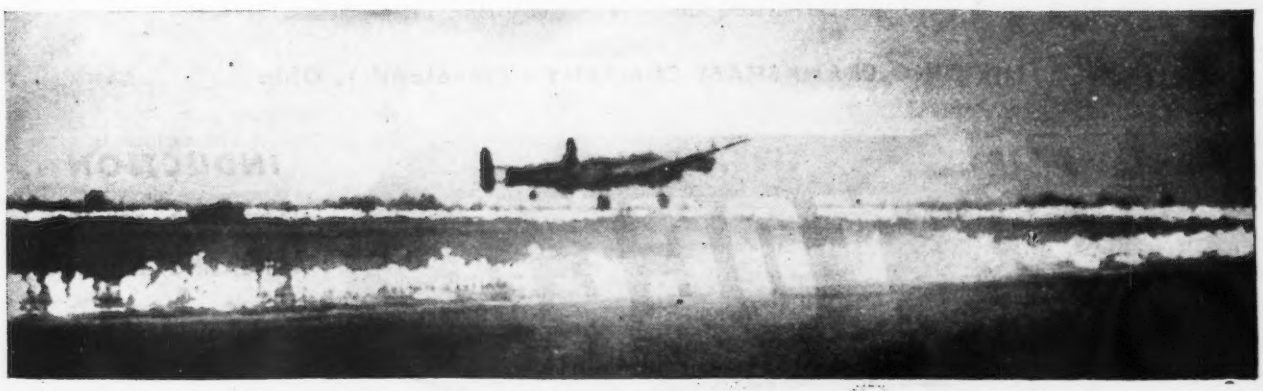
Strip Output to Increase

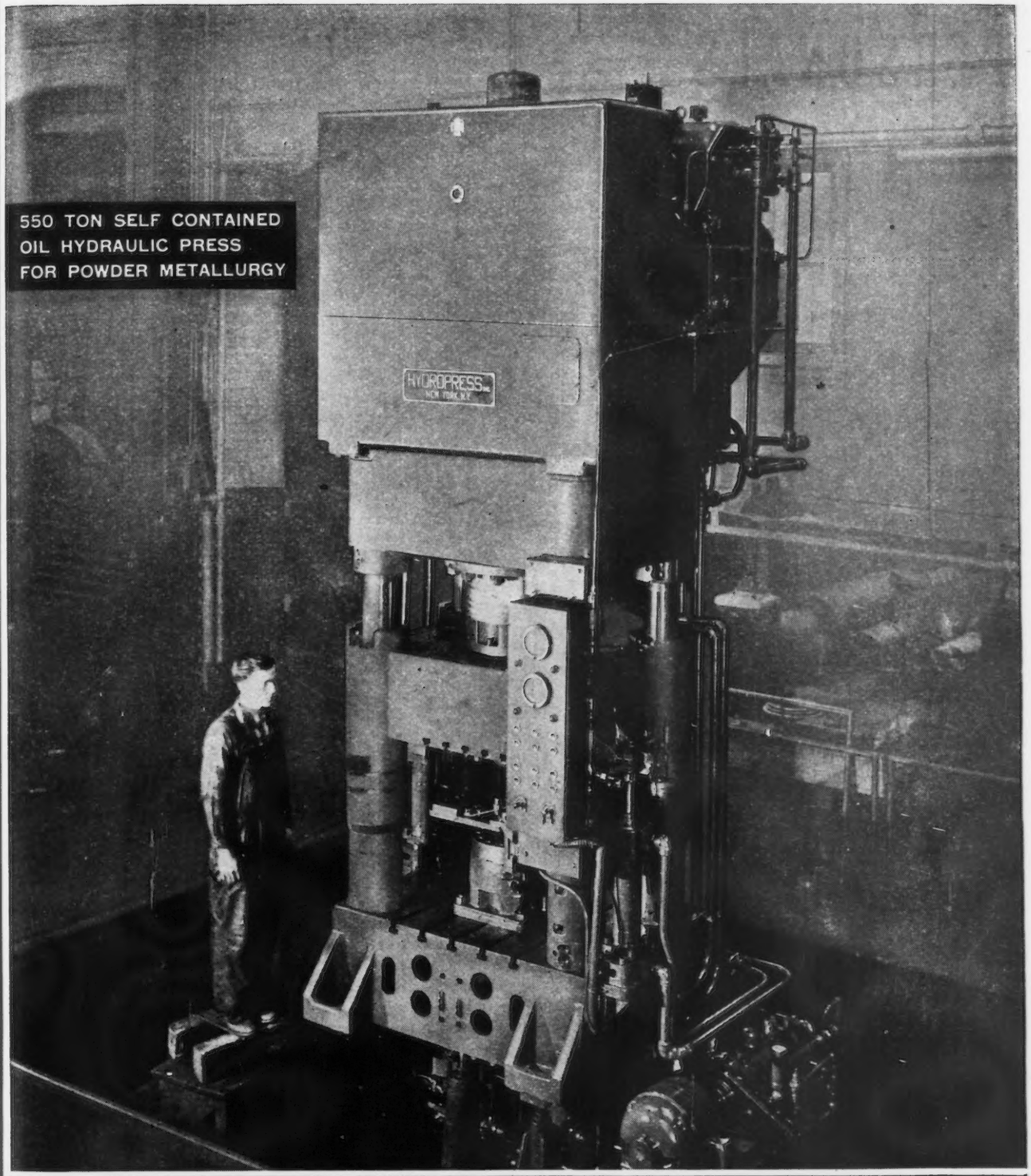
Niles, Ohio

• • • **Production of strip steel** and tinplate at the Niles plant of Republic Steel Corp. will be increased by a new annealing furnace and additional welding equipment for processing strip, soon to be installed—all part of Republic's general flat rolled program.

Costing an estimated $335,000, these new additions have been approved by the War Production Board, but it was reported that this is but a part of the improvements planned for the plant. Already one of the country's most efficient producers of electrolytic tinplate and in the processing of strip.

OPERATION FIDO: *First official RAF photographs to be released on the Fog Investigation Dispersal Operations, a British invention produced by the Petroleum Warfare Department, showing the way fog was dispersed by artificial means. FIDO provides the necessary heat on airfields to bring about fog dispersal by a continuous line of burners installed on each side of the main runway, and had aided more than 2500 Allied aircraft to land safely in dense fog. Here an RAF Lancaster with its outline blurred through the haze of the fires takes off between the two bands of flame as the fog is being dispersed.*





HYDROPRESS · INC.

ENGINEERS CONTRACTORS

HYDRAULIC PRESSES · ROLLING MILLS
STRETCHERS · PUMPS · ACCUMULATORS

570 LEXINGTON AVENUE · NEW YORK · N Y

PERSONALS

A. F. McGRAW, director of sales, Food Machinery Corp.

• **A. F. McGraw** has been appointed director of sales for Food Machinery Corp. with headquarters in San Jose, Cal. Mr. McGraw has had 32 years' experience in the farm implement field. Until recently he was general sales manager of the Allis-Chalmers tractor division, Milwaukee.

• **John C. Graf** has been named sales manager of the Hydraulic and Special Machinery Division, William Sellers & Co., Inc., Philadelphia. For the past two years Mr. Graf has been sales manager of the Baldwin Southwark Division, The Baldwin Locomotive Works, and for 18 years prior was district manager of the New England territory for the same company.

• **A. N. Rosborough,** formerly manager of the Toledo branch of Crane Co., Chicago, has been appointed manager of the Cleveland branch. Mr. Rosborough is succeeded at Toledo by **W. D. LaRue,** formerly manager of the Muncie, Ind., branch, and **R. C. Danielson** becomes manager of the Muncie branch.

• **Ian B. MacLellan** has been elected vice-president and general manager of the Newcomb-Detroit Co., Detroit, Mich. Mr. MacLellan has been associated with the firm since 1918 when it was known as the Grand Rapids Blow Pipe Co. **John Z. Swartz** has been elected secretary and treasurer.

• **Elmer J. Steger,** manager of the pneumatic tool and appliances division, has also been appointed manager of the rock drill division, The Cleveland Pneumatic Tool Co., Cleveland. Mr. Steger is executive vice-president and treasurer of the company's Canadian subsidiary, Cleveland Pneumatic Tool Co. of Canada, Ltd. **Charles E. Vanderpool,** former assistant manager of the pneumatic tool division, has been made sales manager of that division. **Albert H. Hruby** has become sales manager of the rock drill division, and **Robert Craig,** manager of export sales.

• **Dr. Kenneth B. Goldblum** and **Roger Rice** have been appointed group leaders in charge of the research and development, and standards and testings sections, respectively, of the Chemical Laboratory, General Electric Co.'s Plastics Division, Pittsfield, Mass.

• **Walter J. Habermas** has been named manager of the automotive section, Detroit district of Industrial Product Sales Division, B. F. Goodrich Co., Akron, Ohio.

• **Marshal L. Noel,** previously industrial sales manager, has been named general sales manager of the tractor division, Allis-Chalmers Mfg. Co., Milwaukee. **William J. Faulkner,** former manager of the division's Washington, D. C., office, has become industrial sales manager, and **F. B. Harrison** and **E. G. Kullmann,** assistant industrial sales managers. **H. A. Gratner** has been named agricultural sales manager; **Louis Adams,** harvester line sales manager. **Ernest Franks** has been placed in charge of wheel tractor sales for industrial purposes, and **Boyd S. Oberlink** has been appointed assistant to the vice-president.

• **Dr. Earl W. Gluesenkamp** and **Dr. James H. Lum** have been appointed assistant directors of research at the central research laboratories in Dayton, Ohio, of Monsanto Chemical Co., St. Louis.

• **C. J. Smith** has been named head of the engineering department, Monroe Auto Equipment Co., Monroe, Mich.

• **L. R. Keltner** has been named superintendent of the Akron plant of the tire division, The B. F. Goodrich Co.

• **William G. Bostwick** has joined the Precision Welder & Machine Co., Cincinnati, as chief electrical engineer.

• **J. J. Grogan** has been appointed assistant treasurer, Allegheny Ludlum Steel Corp., Brackenridge, Pa., and **V. H. Mantz,** assistant secretary. Mr. Grogan, who succeeds the late W. L. Dankmyer, was with the West Leechburg Steel Co. from 1917 until its merger with Allegheny Ludlum in 1936. Mr. Mantz joined the company in 1943.

• **Robert D. McManigal** has been elected vice-president of the Westinghouse Electric International Co., New York. Mr. McManigal has been manager of the International's Associated Companies Department since 1940.

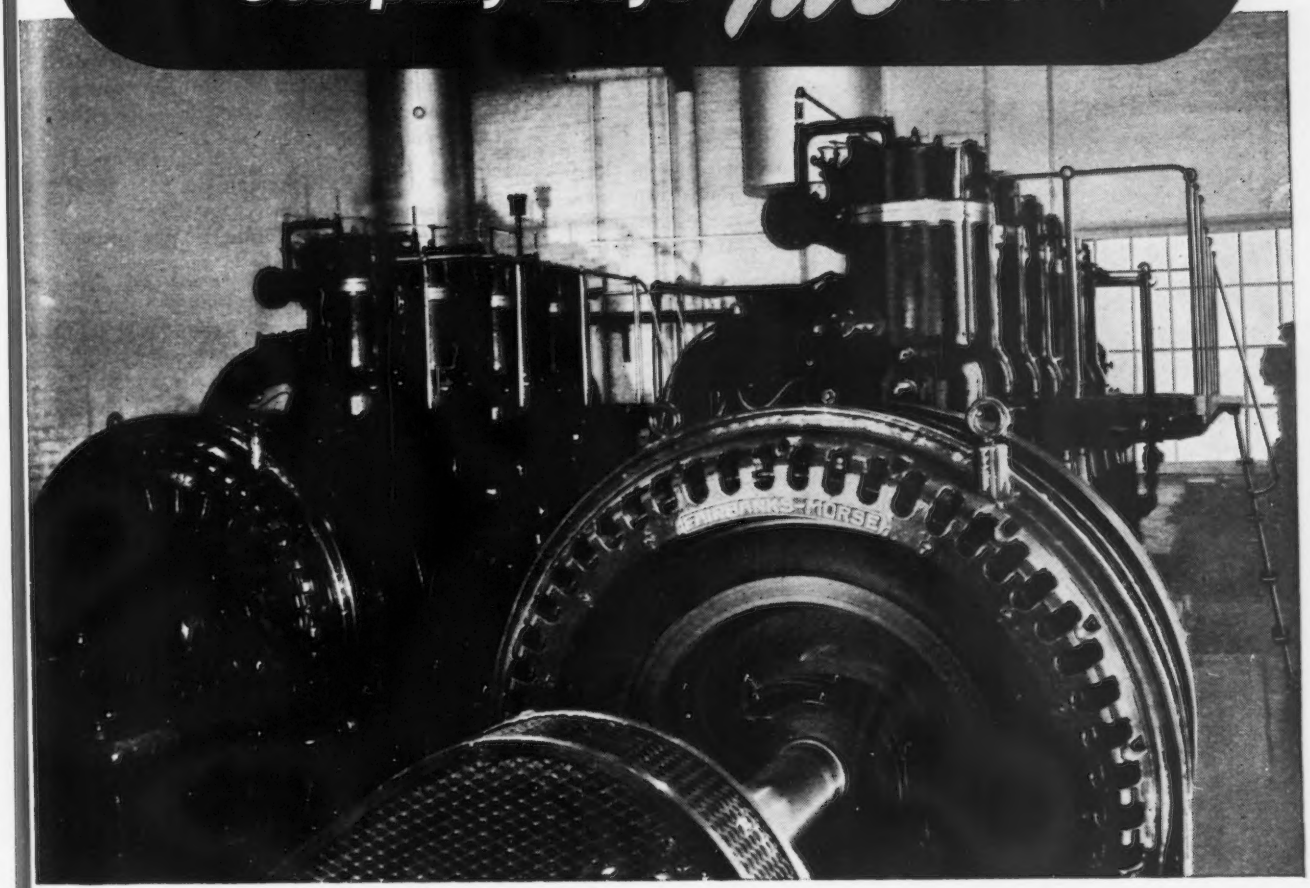
• **William A. Matheson,** formerly president of the Williams Oil-O-Matic Heating Corp., has been elected vice-president of the Eureka Vacuum Cleaner Co., Detroit, which recently acquired **Williams Oil-O-Matic.** Mr. Matheson will be in charge of the Williams Division, responsible for sales and management.

• **Forest W. King** has been appointed works manager at the Warren City Mfg. Co., Warren, Ohio, subsidiary of Graham-Paige Motors.

• **Edward M. Welty** has been appointed general manager of sales of the Industrial Fasteners Division, Oliver Iron & Steel Corp., Pittsburgh. He succeeds **James G. Graham.** Mr. Welty has been with the Oliver organization for 34 years, except for a year and a half when he served as chief of the Bolt and Nut, Screw and Screw Machine Products Division of the WPB.

EDWARD M. WELTY, general manager of sales, Industrial Fasteners Division, Oliver Iron & Steel Corp.

Diesel Demonstrates $3,700 Saving – Company Buys *Two* More!



JUST one year of Diesel operation saved the makers of Valdura heavy-duty maintenance paints $3,700 in plant power costs. So, as expansion plans went into effect, two more Fairbanks-Morse Diesels went into operation.

This is a typical experience. Such performance is built into Fairbanks-Morse Diesels. They're designed for heavy duty, economical operation, low maintenance costs, and long life. And Fairbanks-Morse Generators are built the same way. Fairbanks-Morse power generating units are engineered before you get them. One maker is responsible, one guarantee covers them. For information on how you can save on power, write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY MORE WAR BONDS

Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps
Scales • Magnetos • Stokers • Railroad Motor Cars and Standpipes

CLYDE C. BOHNER, vice-president, Lawrance Aeronautical Corp.

• **Clyde C. Bohner** has been made vice-president of Lawrance Aeronautical Corp., Linden, N. J. Before joining Lawrance Mr. Bohner had been vice-president in charge of sales of the Tungsol Lamp Works, Newark, N. J., and an executive of the Western Cartridge Co.

• **Paul Mueller**, formerly chief engineer of the Blaw-Knox Co., will become, in July, manager of engineering and research, Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn. Mr. Mueller had previously been associated with Pratt & Whitney from 1920 to 1927, after which time he served with the Hartford Machine Screw Co., the General Cable Corp. and the Revere Copper & Brass Co. He joined Blaw-Knox in 1944.

PAUL MUELLER, future manager of engineering and research, Pratt & Whitney, Division Niles-Bement-Pond Co.

• **C. W. Moore** and **C. T. O'Connell** have been appointed sales and service representatives in Atlanta for the Eclipse Counterbore Co., Detroit.

• **John J. Lance** has been appointed field representative in the Cleveland-Mansfield-Youngstown area, for the Special Chemicals Division, Pennsylvania Salt Mfg. Co., Philadelphia.

• **Fred M. High**, formerly roll engineer for Hyde Park Foundry & Machine Co. and Lewis Foundry & Machine Co., has become associated with the roll sales of Aetna-Standard Engineering Co., Youngstown, Ohio.

• **W. H. Robinson, Jr.**, has been named manager of the advertising division of the Lamp Department, General Electric Co., Schenectady, N. Y., with headquarters at Nela Park, Cleveland.

• **Carter T. Pollock** has been appointed manager of the central district, Crane Co., with headquarters in Chicago. **W. A. Burbine** succeeds him as manager of the Chicago branch.

• **Herman J. Schorle** has been made works manager of the Holyoke, Mass., plant of the Worthington Pump & Machinery Corp., succeeding **Harry A. Feldbush**, who has been transferred to the corporation's Harrison, N. J., administrative office. **Willard A. Emery** has been made assistant works manager of the Holyoke plant.

• **H. W. Overman** has been placed in charge of industrial friction materials, Thermoid Co., Trenton, N. J.

• **John W. Craig** has been appointed general works manager of the Richmond, Ind., plant of The Crosley Corp., Cincinnati.

• **T. U. Blake**, has been appointed chief engineer of the B. F. Goodrich Chemical Co., Cleveland.

• **Harry D. Wagner** has joined the staff of engineers serving the Cleveland area of The Foxboro Co., Foxboro, Mass.

• **Miles K. Smith** has joined the Pittsburgh office of the Molybdenum Corp. of America as sales and service engineer.

• **F. F. Duggan** has been appointed general sales manager of the Deepfreeze Division, Motor Products Corp., Detroit.

• **Norman C. Hurd** has been made manager of the Cincinnati Manufacturing and Repair Department, Westinghouse Electric Corp., Pittsburgh. Mr. Hurd has been with Westinghouse since 1920.

• **Ethel S. Klingman** has been named manager of advertising, Pennsylvania Salt Mfg. Co., Philadelphia, succeeding **H. M. Ellsworth**, resigned.

• **John D. Judge** has joined the Mackenzie Walton Co., Pawtucket, R. I., as vice-president.

• **Richard S. Smith** has been elected president, Rigid-Tex Corp., Buffalo, N. Y. **Hubert L. Perry** has been made vice-president and treasurer; **William J. McArdle**, general sales manager; **John E. Emerson**, general manager; **R. Kemp Slaughter, Jr.**, chief engineer, and **Eugene P. Thomas**, mill superintendent.

• **Charles A. H. Knapp** has joined R. Lavin & Sons, Inc., Chicago, as metallurgist and research engineer.

• **W. H. Robinson, Jr.**, formerly sales manager of electric discharge lamps, General Electric Co., Cleveland, has been appointed manager of the lamp department's advertising division.

OBITUARY...

• **David O. Evans**, 69, a vice-president of The International Nickel Co. of Canada, Ltd., and chairman of The Mond Nickel Co., Ltd., its British affiliate, died suddenly in London, June 11. In 1916 Mr. Evans became secretary of Mond Nickel. Upon the merger of this company with The International Nickel Co. of Canada, Ltd., in 1928, he was elected to the board of directors of the Canadian company and appointed delegate director of Mond Nickel. He was elected a vice-president of the Canadian firm in 1936.

• **William L. Dankmyer**, 67, assistant treasurer of the Allegheny Ludlum Steel Corp., Brackenridge, Pa., died May 27. Mr. Dankmyer had been with the company 33 years.

• **William C. Hasslinger**, 36, superintendent of the naval ordnance plant at A. O. Smith Corp., Milwaukee, died June 8.

GAGES OF PRECISION BY WOODWORTH

ALL the facilities of the N. A. Woodworth Company are directed to one objective . . . the manufacturing of precision gages and tools with the longest accurate life to give the user the lowest possible operating cost.

Increase your production efficiency with sustained accuracy by Woodworth.

* * *

1 Speed up production and reduce costs with the Limitrol. The Limitrol Comparator Type Snap Gage checks errors involving pitch diameter, lead, taper, angle, out-of-roundness. It eliminates "feel" and reduces scrap. Write for Folder 44-L.

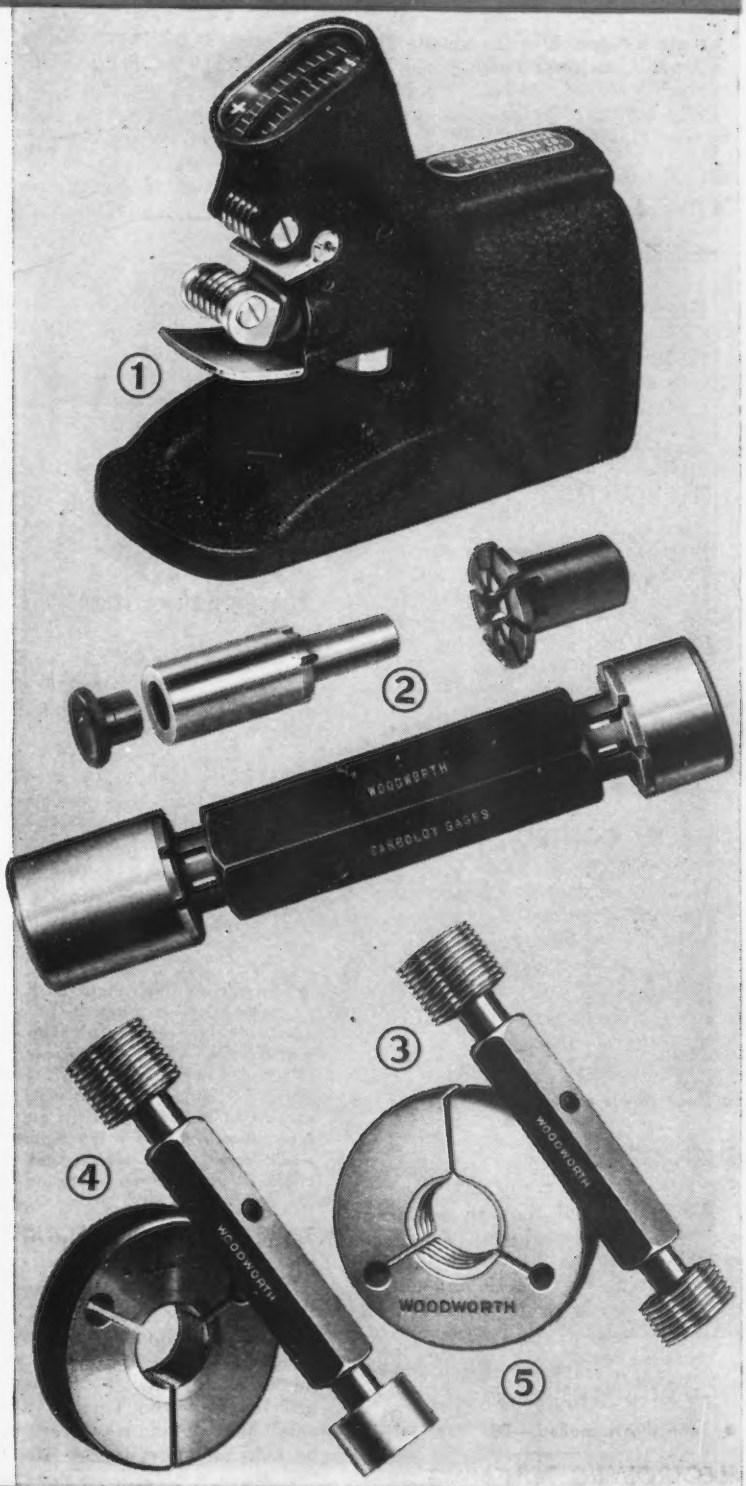
2 Woodworth Carboloy Gages are free from distortions, stresses and strains. Woodworth's exclusive segmented shank compensates for the differences in coefficient of expansion between cemented carbides and steel, thus assuring a trouble-free bond between these two materials. Write for Circular 44-C.

3 Woodworth Durplate Gages are noted for their long life and great accuracy. The Durplate process is exclusively a Woodworth development and confirms the Woodworth slogan, "accuracy you can trust."

4 Woodworth gages of cast Stellite alloy are tough, high wear-resistant . . . have a service life many times that of steel. Gage life is increased from 10 to 20 times. Stellite Cast Alloy Gages are non-corrodible and non-magnetic . . . have a coefficient of expansion close to steel...with other desirable characteristics. Write for Folder 44-S.

5 Gages of Nawlide, a specially processed Woodworth alloy, are outwearing ordinary steel gages many times with no sacrifice in toughness.

ACCURACY YOU W CAN TRUST



WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD · DETROIT 20, MICHIGAN

PRECISION GAGES · PRECISION MACHINED PARTS · PRECISION TOOLS

Dear Editor:

TUBE BENDING

Sir:

I am interested in the article "How to Bend Aluminum Tubes," which appeared Dec. 28, 1944. Would you kindly send me the back number containing this article.

FRED J. MEYER
746 Seventh Ave., San Francisco 18

● Tear sheets mailed.—Ed.

PRECISION CASTINGS

Sir:

Please forward us the booklet containing seven articles on precision casting from THE IRON AGE. We are enclosing our check for 50c.

E. L. PETERSON,
Assistant Treasurer
Alloy Castings Co., Inc.,
Worcester, Mass.

HELP WANTED

Sir:

We would appreciate receiving 50 reprints of the editorial "Help Wanted—and Offered," in the May 24 issue of THE IRON AGE. Your invoice will be paid promptly.

GEORGE W. BACH,
President and General Manager
American Sterilizer Co.,
Erie, Pa.

● Paper rationing prevents us from making reprints. But you may have offset copies made if you wish.—Ed.

QUALITY CONTROL

Sir:

Would you please send me a reprint of the article entitled "A Simplified Approach to Quality Control," by George O. Cutter from the issue of Feb. 15?

J. R. WANDLING,
Wage Standards Department
Eastman Kodak Co.,
Hawk-Eye Works,
Rochester 4, N. Y.

● Tear sheets mailed.

SURFACE FINISH

Sir:

We understand that an article on Surf - Check Roughness Standards covering surface finish RMS values appeared in the Oct. 19 and 26 and Nov. 2, 1944, issues. Please send us tear sheets.

C. A. BROWN,
Assistant Chief Engineer
Dole Valve Co.,
1941 Carroll Ave., Chicago 12

● Tear sheets mailed.—Ed.

ELECTROLYTIC POLISHING

Sir:

I would like to obtain a copy of the article on "Electrolytic Polishing of Metallographic Specimens," by L. H. Hauser, in the issue of Jan. 20, 1944.

W. L. GIBBONS,
Chief Metallurgist
Lapointe Machine Tool Co.,
Hudson, Mass.

● While we do not have this issue, we will attempt to obtain it for you from a back number dealer.—Ed.

CHEMISTRY OF PLASTICS

Sir:

I am completing the manuscript of a book dealing with the "Chemistry of Commercial Plastics." In my chapter dealing with low pressure-no pressure laminating resins, I am most desirous of incorporating the stress-strain charts, Fig. 2 and 3, in an article by Cecil W. Armstrong, "Physical Properties of Fiberglas Laminated Plastics" from THE IRON AGE for July 22, 1943. All of this material gives data relating to MR-IA Fiberglas laminates.

R. L. WAKEMAN,
Fellow
Mellon Institute of Industrial Research,
University of Pittsburgh,
Pittsburgh 13

● We are glad to extend permission for the use of these charts.—Ed.

PERFORATING TUBING

Sir:

We are using 19/32 in o.d. x ½ in. i.d. stainless steel tubing in lengths of 30 in. which we have been perforating by drilling 3/16 in. holes and removing the burr from the inside of the tubing to permit a free flow of liquor. Now we are required to go into a production basis and find that the cost is prohibitive. Is there a possibility of punching these holes instead of drilling them?

GEORGE T. KREIS
Standard Fabricators, Inc.,
355 Walton Ave., New York 51

● Because of the length of the tube, we do not believe it practical to punch these holes because of lack of support for the die member which would have to be inserted through the tube. Furthermore, it would be almost impossible to line up a supporting V-block under the outside of the tube. And even with a sharp punch, burring would occur. A so-called sheet metal drill might be used for this operation.—Ed.

THREAD ROLLING EQUIPMENT

Sir:

Since we have several inquiries for thread rolling machines for screws from our affiliated company in Argentina, we are anxious to learn the names of all possible suppliers of this article. Can you furnish us with a small list of manufacturers who may be able to quote on this item?

FELIX ROTH,
Export Department
Tasco Purchasing Corp.,
40 Exchange Place, New York 5

● Here is a list of machinery producers: Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.; National Machinery Co., Tiffin, Ohio; National Electric Welding Machines Co., Bay City, Mich.; Rolled Thread Die Co., Worcester, Mass.; Wm. A. Schuyler Co., 250 W. 57th St., New York; Watson-Flagg Machine Co., Paterson, N. J.—Ed.

HIGH SPEED CUTTING

Sir:

Will you please send two copies of the article "Super High Speed Cutting of Metals" by Prof. V. D. Kuznetsov from the May 10 issue.

W. E. McKIBBEN,
Research Engineer
Indiana Steel Products Co.,
Valparaiso, Ind.

● Tear sheets mailed.—Ed.

LARGE GASOLINE ENGINES

Sir:

I am interested in securing the names of manufacturers making large gasoline engines for the industrial field, and wondered if you might have such a compilation.

JOHN J. BORRUP,
Production Manager
Pratt & Whitney Aircraft,
Div. of United Aircraft Corp.,
East Hartford 8, Conn.

● Names of manufacturers are on the way.—Ed.

BARBED WIRE SUPPLIERS

Sir:

Kindly send me a complete list of all manufacturers that are presently making barbed wire.

ABRAHAM ZIPKIN
349 E. 149 St., New York 51

● A list of producers has been mailed.—Ed.

MILL SUPPLIES

Sir:

We are eager to obtain a directory of machinery, mill supplies, pipe and valves, steel and iron. If you have such a directory available, please send us a copy.

D. D. SMITH
Weld-Rite Welding Works,
Fort Myers, Fla.

● The publication Mill Supplies, 330 W. 42nd St., New York, puts out a directory containing much of the information desired.—Ed.

WOODWORKING MEDIA

Sir:

We handle woodworking machinery and would like to go into it on a larger scale. We do not know any woodworking trade magazines or papers similar to THE IRON AGE and wonder could you recommend a company who publishes these? Will you please send us a list of these so that we can subscribe and start rolling.

MAX LEACH
H. Leach Machinery Co.,
Providence, R. I.

● A list of woodworking trade magazines is on the way.—Ed.

WIRE ROPE

Sir:

I am endeavoring to compile as complete a library as possible on wire rope and would like to have a copy of the article, "Wire Rope Sales to Be Over 200,000 Tons," which appeared in the Oct. 7, 1943 issue.

LEE P. BURGESS
128 Morris Ave.,
New Haven 13, Conn.

● Tear sheets mailed.—Ed.

The Nested Spring

THAT'S A BIRD OF AN IDEA!

Send for free booklet on the importance of spring design.

● How to pack more spring into less space has always been a problem in product design. And today, when so many plans call for a reduction in product size or packing more power into a unit of the same size, the problem is even more serious. The nested spring is often the answer. It eliminates, in many cases, changing the size or design of the assembly in order to provide working space for a spring of increased capacity.

Designing nested springs requires more than just fitting one spring inside another. Whether to use round or square wire or a combination of both is involved. Extremely careful attention must be given to proper stresses and clearances. These, plus many other factors, emphasize the need for skilled spring engineering, and that's why so many product planners bring their problems to MUEHLHAUSEN SPRING CORPORATION, *(Division of Standard Steel Spring Company)*, 817 Michigan Ave., Logansport, Ind.

***To improve product performance, use* MUEHLHAUSEN Designed SPRINGS**

This Industrial Week . .

- ***Steel Ingot Rate at 90 Per Cent***
- ***Quickie Strikes on the Upgrade***
- ***More Cutbacks Seen This Week***

A CONTINUED sag in the steel ingot rate, a slight increase in the volume of rated steel orders, conflicting reports from Washington as to the availability of civilian steel in the Third Quarter and an apparent epidemic of outlaw steel strikes combined this past week to complicate the steel market picture.

Partly because of the heat and partly because of steel strikes in some areas, the national steel ingot rate this week is estimated at 90 per cent of capacity, up slightly from last week's revised rate of 89 per cent of rated capacity. The low level apparent last week was also due to steel losses occasioned by unauthorized work stoppages. Whether or not the several strikes which have occurred in recent weeks indicate a restlessness among the rank-and-file workers which may increase in intensity remains to be seen.

Philip Murray's strongly-worded telegram to steel strikers in Alabama recently might indicate that the International Office of the United Steel Workers of America does not want wildcat stoppages to disrupt its general plans for attempting to obtain more pay for steel workers. Some sources believe that the increase in the number of steel strikes is the result of the end of the European war and concern over the probable decline in the take home pay. The present backlog of steel orders and the certainty of a tremendous volume of civilian steel orders to come would not seem to indicate any substantial drop in steel operations.

In months to come the national steel ingot rate is expected to be more erratic than at any time since the war began. The approach of warm weather has already made itself felt with more of the same effect to come. The loss in steel production in the past few years due to warm weather was not as great as in normal periods, but the experience this year may revert to the average normal loss, which sometimes ranges from four to six points.

With steel capacity now adequate for war and war-supporting demand, some high-cost steelmaking units may possibly be retired in the near future. Furthermore, the absolute necessity for long postponed repairs to steel mill equipment will be another factor tending towards a lower raw steel rate. Equipment and men have been pushed so strongly in the past few years that some repairs and rehabilitation can no longer be put off. Strikes have hastened these decisions because once the units are down repairs are begun where needed.

DURING this past week there was some recovery in the volume of rated orders over the low level of the previous few weeks. This situation has placed mill order books in a stronger position and thus throws more cold water on current hopes for sizeable civilian steel supplies in the Third Quarter. The current order position, however, varies among individual producers to a greater extent than at any time since the early days of the war. Because of this the WPB effective July 1 will eliminate production directives on steel plate and reinforcing bar producers. This will enable producers of these items to try to make up for the falling off in demand for specialty steel products.

Despite reports from Washington that close to 300,000 tons of sheets and strip would be available for civilian use in the Third Quarter, district market reports do not paint such a rosy picture. It is claimed by steel observers that sheet carryovers are still heavy and that demand for rated sheet tonnage remains heavy. The slowness with which war program cancellations reach the mill levels is another reason why the probability of substantial steel tonnage for civilian use in the Third Quarter seems remote at this time. The steel industry was awaiting with some expectancy cutbacks which were scheduled for this week. Simultaneous meetings in three or four cities were expected to take a heavy toll in the production of war materials. It is believed these cutbacks will not be confined to any one military procurement agency. It is expected that possibly everything from 105 mm. artillery to 240 mm. will be cut sharply and that the 90 mm. artillery program will also be cut to some extent. Other heavy cutbacks looked for will probably involve heavy mobile equipment such as trucks and armored cars.

Because of the length of time consumed in previous cutbacks reaching mill levels it is not expected that those to be made this week will reflect any speedier action. With the Third Quarter almost ready to begin and with steel cancellations still trickling in, most steel officials are taking a realistic view that, although civilian steel may be more plentiful in the Third Quarter, the supply will probably not anywhere near satisfy even restrained civilian demand much before the beginning of the Fourth Quarter.

Although available non-rated steel may not be shipped until after July 1, non-rated steel orders which are expected to furnish the cushion as military programs are cut back were on the upgrade this week. The upsurge in such business covered all types of steel, especially sheets. The latter item, however, continues to be exceptionally tight for rated requirements. The influx of non-rated orders will after July 1 more than make up for any decline which might occur in the volume of orders carrying ratings.

Scrap markets were stronger in practically every area this week. It was believed by most suppliers that inventories in many cases were a little bit too low for comfort. Prices were firmer in the New York district and in the Philadelphia area the price of heavy melting steel advanced an average of 25c. a ton. As a result of this change, THE IRON AGE composite scrap price advanced from $18.92 a gross ton to $19 a gross ton this week.

• **GRAY IRON FOUNDERS' SURVEY**—A survey of the casting industry's some 2600 foundries for immediate or near-future open capacity is being conducted by the Gray Iron Founders' Society, national association of producers of gray iron castings, in an effort to assist dependent industries anxious to place reconversion and civilian goods orders. W. W. Rose, executive vice-president of the society, said that the heavy, increasing volume of requests for possible sources attests an extremely tight supply situation, but he is hopeful that the canvass will uncover a few openings on foundry order books resulting from war contract cancellations or other cutbacks. This is the third survey of this sort that the society has taken since the start of the war.

• **VACATION SHUTDOWNS**—Three eastern Pennsylvania mills, Central Iron & Steel, Allegheny-Ludlum and Florence Pipe & Foundry, have announced that they will shut down for one week during July for vacations and major repairs of their facilities.

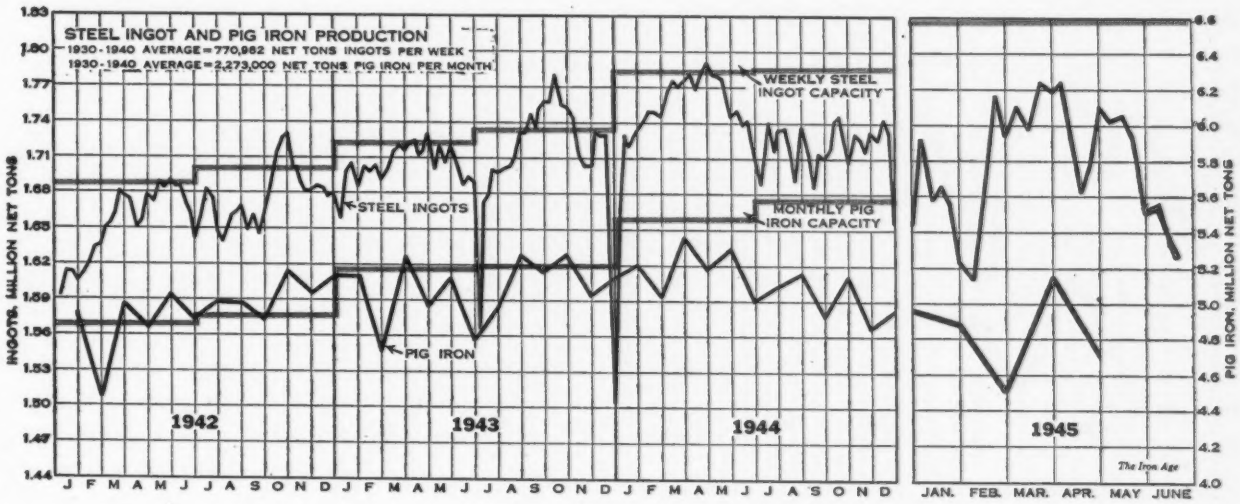
• **IRON ORE SHIPMENTS**—Shipments of Lake Superior iron ore from upper lake ports during May amounted to 11,121,203 gross tons, of which 11,062,580 tons were from U. S. ports and 58,623 tons from Michipicoten, according to the monthly report of the Lake Superior Iron Ore Association. This compared with 12,114,211 tons a year ago when U. S. ports shipped 12,036,614 tons and Canadian ports shipped 77,597 tons. The total movement of 18,403,277 tons to June 1 this year was an increase of 1,000,987 tons from the 17,402,290 ton movement to the same date a year ago. (Included in the U. S. figures were 42,403 tons of Canadian ore.)

• **NEW SCRAP PROBLEM**—Scrap interests are awaiting with a great deal of anticipation cutbacks scheduled for this week and the possibility of relaxed procedures on the scrapping of surplus materials. The procedure in the past to get as high a price as possible for surplus materials seems to be giving way to the procedure of getting rid of it as quickly as possible. This means that there will be less chance of segregation of usable materials from scrap and greater amounts of materials will be forthcoming as scrap. Further, storing of surpluses pending segregation costs considerable money, and this is being abandoned in favor of quick and immediate movement of materials as quickly as it is termed surplus. Cutbacks and surpluses are two opposing forces. Cutbacks will reduce the amount of production scrap and surpluses will increase the volume of unprepared scrap. This latter will add a load to already overworked and undermanned scrap yards, since most of the scrap handled in recent years has been on a producer to consumer basis, by-passing completely the yards.

• **OPA PRICING POLICY**—Office of Price Administration pricing policies are depriving small business of markets and materials, trustees of the National Small Businessmen's Association declared at Chicago on June 12. Criticism was leveled particularly at approval assertedly given two large washing machine manufacturers to start production in return for their agreement to sell at 1941 prices. "The manufacturers know that they will lose thousands of dollars, but agree so that they could get priority on small motors and materials," it was alleged, "taking them away from the small manufacturers who are ready to start manufacture, but cannot do so profitably at 1941 prices." Establishment of a definite pricing formula by Congress was urged, to be based on a prewar date with price ceilings to be increased to the extent of all production cost increases since that time.

• **NIGHT SHIFT RATES UPPED**—Night work premiums of 4c. an hr. for second shift and 8c. an hr. for third shift work at the Timken-Detroit Axle Co. have been approved by the Sixth Regional War Labor Board. The decision modifies a previous 6c. differential set up for the third shift on March 30.

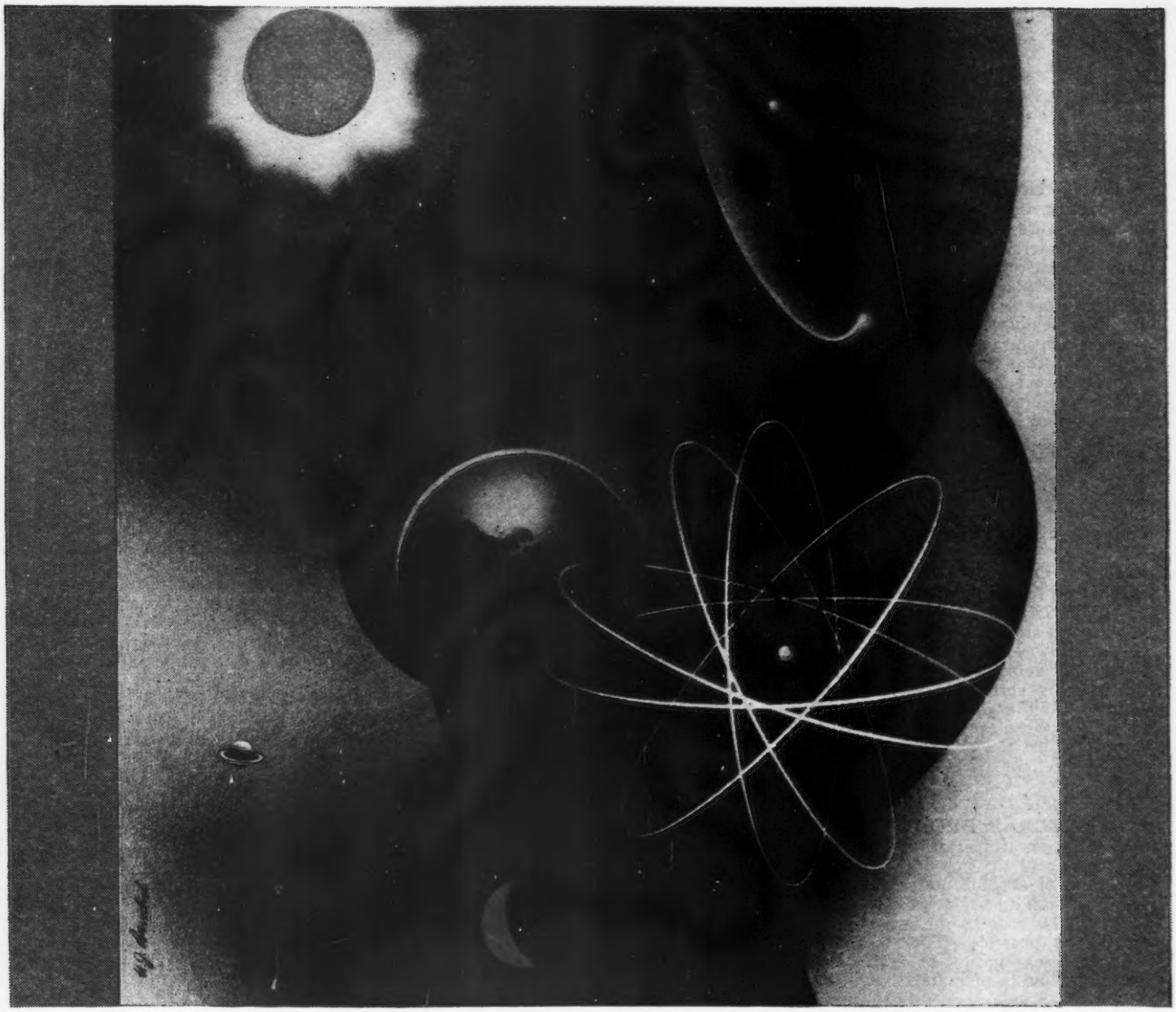
• **BONUS PAY RULING**—Modification of its ruling disapproving incorporation of an 18 per cent profit-sharing bonus into the existing rate structure of the Whiting Corp., Harvey, Ill., has been made by the Sixth Regional War Labor Board. The new ruling provides, however, that new employees shall be hired under the terms of the board's Form 88-C at present rates and shall not be eligible for the rates increased by the bonus until after expiration of a 14-16 week waiting period.


STEEL INGOT AND PIG IRON PRODUCTION
1930-1940 AVERAGE=770,982 NET TONS INGOTS PER WEEK
1930-1940 AVERAGE=2,273,000 NET TONS PIG IRON PER MONTH
WEEKLY STEEL INGOT CAPACITY
STEEL INGOTS
MONTHLY PIG IRON CAPACITY
PIG IRON
INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
1942
1943
1944
1945
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
JAN. FEB. MAR. APR. MAY JUNE
The Iron Age

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
June 12	85.0*	96.0	92.0	95.0	96.0	104.5	90.5	18.0*	84.5	71.0	102.0	75.0	88.5	89.0*
June 19	91.0	95.5	90.0	92.0	94.0	104.5	91.0	54.0	84.5	77.5	67.0	75.0	91.5	90.0

* Revised



Electronic Futures
ARE AS LIMITLESS AS SPACE

But... IT TAKES Special Electrical Alloys TO TRANSLATE FANCIES INTO FACTS

AS alloy steel specialists, one of our jobs for many years has been the researching and commercial development of special electrical materials—highly individualized alloys which have helped many a designer to realize in fact what he hoped for in theory. We developed a number of these materials, and some of them are at the heart of the war's most valuable contributions to the electrical and electronic sciences of the future.

The Allegheny Ludlum line of finely developed silicon steels, high-permeability and high-resistance alloys, and glass-to-metal sealing alloys is most complete. What's more, it is backed by exhaustive data on characteristics and performance, and amplified by full technical cooperation. •Whatever you want to do, electrically or electronically, let us work with you. Allegheny Ludlum Steel Corporation, Brackenridge, Pa.

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W&D...9576-B

Chicago Mills Ponder Geneva Steel Freight Rate Proposals

By CHARLES T. POST

o o o

Chicago

• • • **Midwestern steel producers** are watching carefully proposals that commercial freight rates on finished steel from the big Geneva, Utah, plant to the West Coast be drastically lowered to put the plant in a better postwar competitive position.

Rates suggested for rail shipment to the Coast from the Utah plant would, local traffic experts declare, pave the way for rates from the Chicago district to the Coast on a like basis which would put local mills in the far western market with both feet. Possible further repercussions, were the Utah-West Coast rate lowered, could include efforts to correspondingly lower freight rates on finished steel throughout the United States and a revision of western rates on agricultural commodities, which constitute bread-and-butter freight tonnage of the western railroads.

See page 104A this issue for report on the surplus steel plant problem.

The present commodity rate on finished steel products from Geneva to the Coast is $12.00 per net ton. Studies of the postwar competitive position of Geneva indicate that, granting approximately equal production costs as eastern mills, the Utah plant must have a freight rate approximately equal to the actual cost of water transportation of steel from the Birmingham and Sparrows Point districts to the West Coast in order to compete effectively postwar. The published water rate is approximately $11.00 from Sparrows Point, but the actual cost to steel companies operating their own vessels is said to be about $6.00 a ton. The traffic bureau of the Department of Industrial Development of the State of Utah and others interested in the Geneva mill have contended that the Geneva-Coast rate should be $5.31 per ton upon the basis of a rate of $4.95 per gross ton for pig iron from Geneva to the Coast and a coastwise rate of $4.40 per net ton on finished steel from Fontana to San Francisco, Calif.

In the spring of 1944 a Section 22 rate of $8.00 per ton on finished steel from Geneva to San Francisco Bay points was established over the Denver & Rio Grand Western and Western Pacific route, covering government shipments for the duration plus six months. Corresponding rates of $9.50 per net ton to Portland, Ore., and Vancouver, Wash., $10.00 per net ton to Tacoma and Seattle, and $10.50 per net ton to Everett and Bellingham, Wash., from Geneva, were established by the Union Pacific. Other western roads balked at such special rates on government wartime shipments, presumably in the fear that it would lead to demands for correspondingly reduced Section 22 rates for other steel producing centers served by them.

Railroad freight officials stand on the $12.00 per ton rate on commercial shipments as being equitable on the basis of the distance involved, 861 miles from Geneva to San Francisco. Other finished steel rates cited are Pittsburgh-Kansas City, 889 miles, at $12.80; Chicago-New York, 978 miles, $10.40; Chicago-Denver, 1034 miles, $18.20; and Minnequa (Pueblo), Colo.-San Francisco, 1448 miles, $16.90. The latter rate would be among the first to come under attack should concessions be made on the Geneva-Coast rate. Prior to World War I, Colorado Fuel & Iron Corp., whose mill is at Minnequa, enjoyed a lower rate to West Coast markets through relief granted under Section 4 of the Interstate Commerce Act, the well known "long haul-short haul" clause. Despite efforts this relief since always has been refused.

Revision of these and other finished steel rates would not be automatic, but shippers would be placed in a strong position to request modification of such rates, steel traffic officials say. In a particularly strong position would be those firms now shipping to the East Coast by rail, thence to the West Coast by water, whose prewar markets in the far west would be most seriously threatened by Geneva competition. Were a $5.31 Geneva-Coast freight rate granted, Chicago district mills would, on this basis, request a Chicago-San Francisco rate of approximately $10.00 per ton. If the $8.00 rate now applicable to government shipments were extended to cover commercial shipments, the Chicago mills would aim for a Chicago-San Francisco rate of not to exceed $14.00 per ton. This compares with a present rate from Chicago to the Coast of $22.00 per ton. On tin plate shipments a special rate of $15.00 per ton now allows Chicago mills to compete effectively in the Coast markets, and anything lower than that on other products would effectively place them in a competitive

PW'S IN LONDON: *German prisoners of war have started work on a housing estate at Shooter's Hill, S.E. London. They will be used to rebuild bombed out residential districts.*

position in the far west which they do not now enjoy.

In the early part of the century, James J. Hill, in his development of the Northern Pacific, established a long haul rate from the midwest to the West Coast allowing midwestern producers to compete effectively there with steel shipped by water to the Isthmus or Mexico, across by rail, thence to West Coast points by water. Objections were made by inland cities in the Pacific Northwest that the rate from the midwest to the Coast was lower than that from the midwest to points along the route. This led to revision of Section 4 of the Interstate Commerce Act to provide that tariffs to intermediate points could not exceed the long haul tariff, the famous "long haul-short haul" clause. Thus it became necessary to abandon the cheap rates on steel to the Coast in order to protect rates to the intermediate points, and effectively put an end to competitive all rail shipments of steel to the West Coast. A new rate from Geneva to the Coast would probably involve some modifications of intermediate rates on the long haul-short haul basis, particularly in the Rocky Mountain states. If subsequent modifications from Chicago to the Coast were made, short haul modifications would follow over a large part of the route.

A more serious consideration, in the view of some experts, would be the effect of a Geneva-Coast rate modification, and its repercussion on other rates, in the light of the Hoch-Smith resolution. This resolution, passed by Congress in 1925, directed the Interstate Commerce Commission to "effect with least practicable delay such lawful changes in rate structure of the country as will promote the freedom of movement by common carrier of the products of agriculture including livestock at the lowest possible lawful rates compatible with the maintenance of adequate transportation service." This, in effect, means that rates on industrial products must not be set below those on agricultural products without bringing the agricultural rates in line. Agricultural rates cited by railroad officials include a potato rate, for a haul of 895 miles, of $9.80 per ton, and a livestock rate, for 800 miles, of $11.00 per ton. Downward modification of agricultural rates by the western railroads could result in loss of far more revenue than that gained by steel shipments from the Geneva mill if the agricultural rate cut necessitated were more than minor. If severe reductions had to be made on steel shipments from the midwest to the Coast, necessitating widespread agricultural rate adjustments, the entire income structure of the western railroads would be altered in view of the heavy agricultural traffic in the midwest.

The Interstate Commerce Commission policy is opposed to establishing a lower rate on one commodity which directly necessitates the higher rate in another, thus making it further impracticable for the railroads to go after West Coast business in competition with canal water shipments.

Some railroad circles comment that a $5.31 Geneva-Coast rate also would bear scrutiny in the light of ICC practice of opposing establishment of rates below out of pocket costs. Out of pocket costs on the far western roads are believed to be such as to put a $5.31 rate in a borderline category. This rate would approximate 6.1 mills per ton mile.

The rate reduction also might affect coal rates from Utah to Fontana, Calif., where Geneva's principal West Coast producing competitor, Kaiser Co., Inc., is located. Fontana's present coal rate from Utah is $4.40 per ton which would, in view of lower rates affecting raw materials, possibly be reduced to $2.75 per ton if Geneva's finished steel rate were reduced to $5.31.

WEST COAST FREIGHT RATES

	Pig Iron (gross ton)	Blooms, Ingots, Slabs, Billets (gross ton)	Finished Steel (net ton)
Minnequa, Colo. (Pueblo)—Coast	7.70	17.00	17.00
Geneva, Utah—Coast	4.95	5.78	12.00
Chicago—Coast	11.44	22.00	22.00

DISGUISED PILLBOX: *This innocent looking fruit and greengrocery store in Kingston-on-Thames is a cleverly camouflaged pillbox. Similar secret and concealed war defenses in England dotted the country.*

Chrysler Reports Sale Of Tanks Reach 21,000

Detroit

• • • **Chrysler Corp.** has sold more than 21,000 tanks in the past four years, and has modified and reconditioned an additional 4000 more vehicles, it was reported in a quarterly message to stockholders.

The recapitulation of tank manufacturing activity by Chrysler pointed out that 10 different designs were produced at the Detroit Tank Arsenal operated by the company, wherein manufacturing facilities were spread over 3,200,000 sq. ft. of floor space, including facilities devoted to supply work in 13 other company plants.

Employees at one time totaled more than 20,000, producing as many as 35 tanks daily on a three-shift basis. Current tank production, the message said, is around 20 units a day.

K. T. Keller, president, pointed out that if the number of tanks Chrysler built were translated into the requirements of armored divisions, Chrysler has made enough to equip considerably more than 100 such divisions.

The company has also maintained a large proving ground in which 62 different kinds of tanks and fighting vehicles have been tested.

Heat and Product Mix May Cause A More Erratic Steel Production Rate

New York

• • • **In months to come** the national steel ingot rate is expected to be more erratic than at any time since the war began. Furthermore, the variations among areas from the national average may become more pronounced than it has been recently.

One of the several factors which are expected to exert their adverse influence on the raw steel rate is the approach of warm weather. In recent years under the impetus of war steel requirements, steel loss because of warm weather has been below the average for normal years. This year the situation may be different and the loss due to heat waves greater.

With plenty of steel capacity to take care of war and war-supporting steel requirements many companies are expected, even at the expense of turning down civilian orders, to take the time to make repairs and renovations long overdue. It is also to be expected that at least some part of the higher cost steel equipment will not be utilized if it is not needed for strictly war and war-supporting purposes.

During the two-front war a considerable steel capacity classified as high cost was utilized to the fullest extent in order to meet military demands. With the situation expected to change in coming months and with more steel capacity to become available for civilian needs, it can hardly be expected that obsolescent and high-cost steel equipment will continue to be utilized when the steel industry insists that the recent price relief was far from the amount necessary to prevent losses on some steel products.

In addition to these factors, all of which will operate to keep the steel rate from reaching full capacity on the basis of current capacity figures, the change in product mix will tend to depress the ingot rate. As war contract cutbacks reach steel mill levels and as various products are changed on schedules, there is bound to be some temporary dislocation in the raw steel rate until the reconversion to at least partial civilian output is obtained.

Despite the operation of the above deterring factors most steel officials do not expect that the ingot rate will go much below 90 per cent — at least until the period immediately following the end of the Japanese War. During that time it is anyone's guess according to trade opinion as to the duration and depth of any decline.

It is generally believed that the length of any temporary recession as well as the seriousness of it after the Japanese War will depend on how soon the latter occurs.

If it should come earlier than expected and before partial reconversion has been brought about, most steel officials believe that the period of decline will be much longer and the depth greater.

On the other hand if the Japanese War should last for a year or more the temporary reconversion period in the steel industry may last only a few months and the ingot rate may not go much, if any, below 70 per cent of the present rated capacity.

The depressed operation at the Geneva Steel Co. plant is due to a falling off in demand for plates and shell steel. While the mill has no present facilities for more sought-after items the situation there is an exaggeration of possible shifts in product demand elsewhere.

Supply of Wrought Iron Eased by Navy Chain Order Cutback

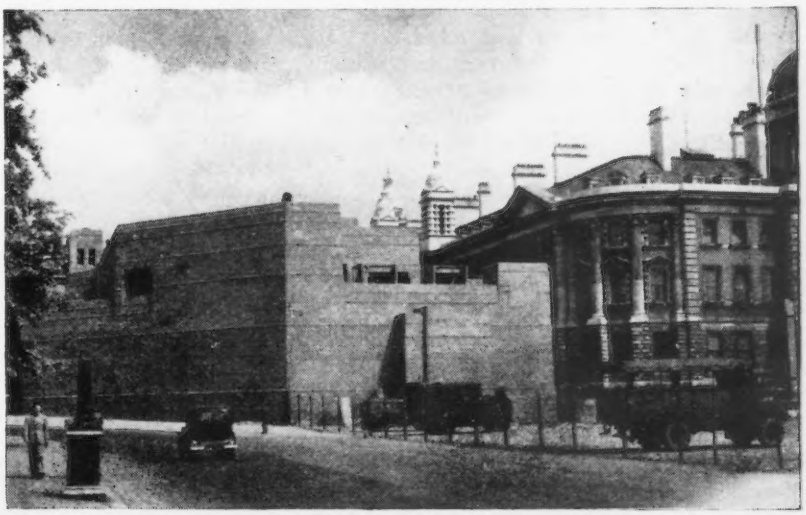
Washington

• • • **Recent heavy Navy** cutbacks in chain orders, the WPB Steel Division reported recently, have changed virtually overnight a tight situation to one of relatively ample supply of wrought iron, and railroads will be among the principal beneficiaries. Through this increase in the wrought iron supply, it was pointed out, the carriers will probably be able to fulfill their heavy requirements for wrought iron staybolts and high-grade iron.

Deliveries of wrought iron plates, forging billets, pipe and tubing, staybolt bars and chain iron can now be made with reasonable promptness, G. L. Moore, chief of the Wrought Iron Section in the Steel Division said. However, deliveries will still be delayed in some instances if purchasers insist upon the product of a particular mill or brand of iron.

There will continue to be delays, he said, in the deliveries of special wrought iron shapes and bars of very small size because the demand for these particular products does not warrant carrying large stocks in warehouses. Since orders for this type of material are usually issued for small quantities, the producer delays rolling until sufficient orders are accumulated to warrant the operation of a mill equipped to roll special shapes and small-size bars. Production of wrought iron has averaged about 160,000 tons annually during the last three years.

MORE WAR SECRETS: *This bleak construction beside the Admiralty building in London was to be used as a citadel during heavy bombings or in the event of invasion. Such defense secrets are now being disclosed by the British.*



Army Cutbacks Will Total Six Billion During Eight Months

Washington

• • • **Complete replanning** of the Army Service Forces procurement program for a one-front war will find deliveries down 32 per cent in the last eight months of 1945. In terms of dollar value this reduction amounts to approximately $6,000,000,000.

The reduction from 27.7 billion to 21.6 billion includes what would amount to a 36 per cent cut for ground forces alone. For the year 1946, the reduction amounts to 29 per cent below the 1945 schedule.

According to the Service Forces statistics, as released by Howard Bruce, director of material for the ASF, the total drain on the nation's productive forces by these procurement programs will continue to decline, although the future programs are, of course, subject to revision.

June, 1945, deliveries are expected to be 15 per cent below those of March. By December the rate will be down 27 per cent from March, the last full month of production for a two-front war.

In terms of individual items or categories, the following are a few examples of the varying magnitudes of the reductions to be effected. The schedule for the month of December, 1945, representing the one-front war production, is compared with actual March, 1945, deliveries for a two-front war, and the differences are expressed in terms of per cent reduction from the March level.

Item	Per Cent Reduction, December from March, 1945
Jeeps (¼ T. 4 x 4)	76
Light-heavy trucks (2½ T. 6 x 6)	75
Garand rifle (M1)	95
Carbine	9
Light tanks, M24	76
General Sherman tanks, M4	100
Cal. .50 ammunition	59
Heavy field artillery	78
105 mm. How. (M2A1)	81
Ammunition for 105 mm. How. (HE, M1)	49
Ammunition for 8 in. How. (HE, M106)	40
Ammunition for 155 mm. How. (HE, M107)	47
Field wire, W-110	46
Assault wire, W-130	36
Handie-Talkie sets, SCR-536	68
Walkie-Talkie sets, SCR-300	75
Telephone and telegraph equipment	45
Tractors, Class I through Class IV	59
Overcoat, wool, O.D.	54

Not all items have been cut back, however. The needs of the Pacific war require the same or increased production of many individual items or categories.

The following are a few examples:

Item	Per Cent Increase December over March, 1945
Weasels (M29C)	42
Amphibious "Dukws" (2½ T. 6 x 6)	63
Ammunition for 60 mm. mortar (HE M49)	65
Aircraft incendiary bombs	172
Aircraft HE and fragmentation bombs (8 principal types)	33
Construction equipment	7
Shirt, cotton, khaki	139
Boots, service, combat	0
QM service and warehouse equipment	32

According to Mr. Bruce, "The production needed to bring about the complete defeat of Japan will still require a large portion of the nation's productive capacity. Full reconversion must therefore await final victory. Our primary objective now is complete victory over Japan. The resourcefulness and the tremendous production capabilities displayed in the achievement of our maximum munitions program, however, provide a heartening perspective on the economic possibilities for this country following such victory.

Coke Workers Touch Off Clairton Strike Due to Hot Weather

Pittsburgh

• • • **A strike** at the Clairton by-product coke works of Carnegie-Illinois Steel Corp., starting on June 12 and lasting through the end of the week, cut sharply into steel production of the U. S. Steel Corp's Pittsburgh district subsidiaries and took about 8000 workers off their jobs. The strike started when 50 workers at one of the Clairton batteries refused to work because they received no heat relief. Under the contract, the workers are to be relieved by "spell-men" when the temperature is 90 deg. for three consecutive days. Although the temperature had not reached 90 deg. for three consecutive days, these men refused to work. Their walkout was followed quickly by workmen on other batteries, and, in addition, some 625 maintenance men, some pipe fitters, and other workers walked out in sympathy.

Following a strike vote Friday, June 15, the men started back to work, and by Sunday evening, June 17, the coke plant was back to normal operation. The steel loss was estimated at about 50,000 tons and the iron loss at 45,000 tons. Finished steel losses were in the neighborhood of 62,000 tons, and coke losses totaled 69,000 tons, according to company estimates.

A total of 14 blast furnaces were shut down, six immediately because of the lack of need for iron caused by steelmaking curtailment. The remaining eight were shut down because of the lack of coke. Eight were scheduled to go back into production by June 18. Blast furnaces at Clairton, Duquesne, Homestead, Edgar Thomson, National Tube at McKeesport, Farrel, and Ohio works were affected.

Open hearth production was cut sharply, with a total of 53 open hearths being shut down. At Homestead, 33 were off, 11 at Clairton, eight at Duquesne, and one at Edgar Thomson. The four Bessemers at Edgar Thomson and three at the Ohio works were also shut down.

At the high point, 19 rolling mills were shut down, which was late Thursday. On Friday afternoon, three of these were started again, and between Friday afternoon and Monday, five were started at Clairton, and others at Duquesne and National Tube were brought into production. Normal operations will be resumed as quickly as possible.

Avery C. Adams Leaves U. S. Steel Corp.; Post Filled by D. F. Austin

Pittsburgh

• • • **Early this week** Benjamin F. Fairless, president, U. S. Steel Corp. of Delaware, announced the resignation of Avery C. Adams, vice-president, sales. At the same time, he announced that David F. Austin, vice-president in charge of sales, Carnegie-Illinois Steel Corp. has been appointed acting vice-president, sales, U. S. Steel Corp. of Delaware.

Mr. Adams before joining U. S. Steel Corp. of Delaware was vice-president in charge of sales of Inland Steel Co. Previous to that time he was manager of the Sheet Sales Division of Carnegie-Illinois Steel Corp. Mr. Adams' future plans were not disclosed at this time.

Mr. Austin has been with the Carnegie-Illinois Steel Corp. for a considerable length of time and has worked himself up from district salesman to the second top position in Carnegie-Illinois Steel Corp. during the most hectic war period he served in the Iron and Steel division of the War Production Board.

Car Shortages Place Industry on Urgency List for Production

Washington

• • • **Concerned over** mounting car shortages as the railroads face the redeployment of troops from Europe to the Pacific, their heaviest war burden, WPB recently placed on the National Production Urgency List the entire freight car manufacturing industry, the entire railroad-brakeshoe manufacturing industry and the entire chilled-railroad-car-wheel manufacturing industry. Also put on the list were certain malleable iron and steel foundries making components for locomotives and freight cars. WPB said that its decision was based on surveys that indicate the growing car shortages might constitute a serious threat to both war and civilian shipments by late summer and remain so during the fall and winter months.

The step provides urgency ratings of the third band or better for 112 plants located in 17 states and will open the way for similar elevation in manpower ratings. Generally speaking, only direct military producers have higher ratings.

The car shortages, WPB said, did not become troublesome until October 1943, the maximum shortage for the year being 5013, largely box cars for the movement of grain. In 1944, however, it was added, they became continuous with maximum shortages of 7926 and 7614 reported for the weeks ended Feb. 2 and Oct. 28, respectively.

Officials said that this year the situation has been much more serious. Aggravated by the snow blockades during the late winter months, they reached a high of 19,397 cars in mid-March, it was stated, and the current shortage was declared to be somewhat more than 10,000 cars.

AMERICAN IRON AND STEEL INSTITUTE
CAPACITY, PRODUCTION AND SHIPMENTS

Period APRIL - 1945

Steel Products	Number of companies	Items	Maximum Annual Potential Capacity Net Tons	Current Month: Production Net Tons	Current Month: Production Per cent of capacity	Current Month: Shipments (Net Tons) Total	Current Month: Shipments (Net Tons) To members of the industry for conversion into further finished products	To Date This Year: Production Net Tons	To Date This Year: Production Per cent of capacity	To Date This Year: Shipments (Net Tons) Total	To Date This Year: Shipments (Net Tons) To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	49	1	xxxx	xxxx	xxx	856,484	215,659	xxxx	xxx	3,104,410	762,147
Structural shapes (heavy)	11	2	9,580,550	258,133	36.0	273,090	xxxx	1,063,599	36.5	1,089,217	xxxx
Steel piling	3	3		25,548		24,855	xxxx	87,561		88,759	xxxx
Plates (sheared and universal)	27	4	17,841,320	675,599	46.0	668,717	40,359	3,007,477	51.2	2,956,520	187,099
Skelp	6	5	xxxx	xxxx	xxx	58,658	31,070	xxxx	xxx	250,303	147,513
Rails—Standard (over 60 lbs.)	4	6	3,669,000	169,244	56.1	173,377	xxxx	736,638	61.0	732,298	xxxx
—All other	5	7	512,000	16,450	39.0	15,199	xxxx	59,371	35.3	60,835	xxxx
Splice bars and tie plates	12	8	1,745,960	61,723	43.0	64,982	xxxx	253,088	44.1	260,949	xxxx
Track spikes	10	9	349,400	12,946	45.0	12,829	xxxx	51,263	44.6	53,013	xxxx
Hot Rolled Bars—Carbon	36	10	xxxx	789,357	xxx	599,538	90,850	2,988,259	xxx	2,318,365	361,736
—Reinforcing—New billet	13	11	xxxx	35,110	xxx	47,419	xxxx	194,890	xxx	199,114	xxxx
—Rerolled	13	12	xxxx	5,461	xxx	4,663	xxxx	22,478	xxx	25,097	xxxx
—Alloy	24	13	xxxx	269,182	xxx	195,612	23,611	1,078,025	xxx	787,503	95,856
—Total	46	14	22,381,700	1,099,110	59.7	847,232	114,461	4,283,652	58.2	3,330,079	457,592
Cold Finished Bars—Carbon	23	15	xxxx	156,930	xxx	158,072	xxxx	605,161	xxx	604,449	xxxx
—Alloy	24	16	xxxx	38,122	xxx	36,947	xxxx	154,112	xxx	142,695	xxxx
—Total	31	17	3,015,910	195,052	78.6	195,019	xxxx	759,273	76.5	747,144	xxxx
Tool steel bars	17	18	273,010	12,365	55.0	12,562	xxxx	47,716	53.1	48,089	xxxx
Pipe & Tubes—Butt weld	16	19	2,232,520	134,735	73.3	131,796	xxxx	504,892	68.8	483,074	xxxx
—Lap weld	9	20	830,200	50,873	74.5	52,151	xxxx	180,522	66.1	183,561	xxxx
—Electric weld	19	21	1,570,900	88,258	68.3	79,643	xxxx	350,854	67.9	306,943	xxxx
—Seamless	16	22	3,377,700	280,305	100.9	209,958	xxxx	1,049,912	94.5	835,509	xxxx
—Conduit (cap. & prod. incl. above)	7	23	xxxx	xxxx	xxx	7,004	xxxx	xxxx	xxx	29,132	xxxx
—Mech. tubing (cap. & prod. incl. above)	11	24	xxxx	xxxx	xxx	63,084	xxxx	xxxx	xxx	268,403	xxxx
Wire rods	27	25	7,266,670	387,650	64.8	113,434	35,701	1,543,984	64.6	434,252	141,821
Wire—Drawn	41	26	5,664,690	300,947	64.6	184,314	7,272	1,236,589	66.4	740,760	32,877
—Nails and staples	19	27	1,253,360	47,420	46.0	51,082	xxxx	200,377	48 6	201,489	xxxx
—Barbed and twisted	15	28	539,610	19,949	44.9	19,948	xxxx	80,036	45.1	78,755	xxxx
—Woven wire fence	16	29	1,113,860	29,330	32.0	29,994	xxxx	126,395	34.5	125,327	xxxx
—Bale ties	12	30	149,700	5,519	44.8	7,021	xxxx	23,857	48.4	26,308	xxxx
Black Plate—Ordinary	9	31	xxxx	xxxx	xxx	53,844	880	xxxx	xxx	173,848	1,659
—Chemically treated	8	32	465,000	9,905	25.9	8,806	xxxx	42,248	27.6	37,695	xxxx
Tin and Terne Plate—Hot dipped	10	33	3,793,850	152,269	48.8	198,066	xxxx	660,935	53.0	726,712	xxxx
—Electrolytic	10	34	2,231,820	63,894	34.8	86,693	xxxx	272,628	37.1	291,104	xxxx
Sheets—Hot rolled	29	35	19,197,320	1,123,358	71.1	598,478	44,754	4,429,840	70.2	2,289,507	145,024
—Cold rolled	12	36	7,131,460	360,343	61.4	213,180	xxxx	1,448,469	61.8	839,922	xxxx
—Galvanized	16	37	2,915,130	143,445	59.3	150,190	xxxx	587,933	61.3	584,551	xxxx
Strip—Hot rolled	24	38	7,055,390	223,546	38.5	146,948	25,566	917,669	49.5	578,101	93,421
—Cold rolled	35	39	3,119,850	118,048	46.0	117,600	xxxx	482,196	47.0	455,085	xxxx
Wheels (car, rolled steel)	5	40	319,400	26,744	101.8	26,649	xxxx	99,398	94.6	98,406	xxxx
Axles	6	41	408,170	13,158	39.2	13,184	xxxx	48,524	36.1	48,526	xxxx
All other	5	42	190,490	3,842	24.5	3,715	xxxx	15,956	25.5	14,996	xxxx
TOTAL STEEL PRODUCTS	152	43	xxxx	xxxx	xxx	5,769,786	515,722	xxxx	xxx	22,573,382	1,969,153
Effective steel finishing capacity	152	44	67,310,000	xxxx	xxx	xxxx	xxxx	xxxx	xxx	xxxx	xxxx
Percent of shipments to effective finishing capacity	152	45	xxxx	xxxx	xxx	94.9 %	xxxx	xxxx	xxx	93.1%	xxxx

During 1944 the companies included above represented 99.0% of the total output of finished rolled steel products as reported to American Iron and Steel Institute.

Maximum Annual Potential Capacity: Embraces the total tonnage of each product that could be produced under full operations, assuming exclusive use of all available facilities and without regard to the availability of ingots. For those types of rolling mills and other producing facilities which produce more than one product, the full capacity for each product is shown, regardless of the fact that such producing facilities have not capacity to produce the aggregate tonnage shown for all such products. As an illustration, for a continuous strip-sheet mill producing both plates and sheets, the full capacity of the mill to produce each product is included, regardless of the other product.

300,000 Tons of Sheet and Strip To Be Available During Third Quarter

Washington

• • • **WPB Chairman J. A. Krug** told the Senate Small Business Committee on June 18 that of the overall estimate of 1,000,000 tons of civilian steel to be available in the third quarter, 300,000 tons will be sheet and strip. Mr. Krug explained that this estimate is based on production uninterrupted by hot weather or labor conditions. When asked what portion of this supply will be needed by the automobile industry for production of the 200,000 cars set for 1945 output, Mr. Krug said that about 170,000 tons will be required.

Both the steel supply situation and military cutbacks were discussed by Mr. Krug in the course of his testimony which was primarily a response to the committee's request that he explain the board's reconversion program as it will affect small business. Mr. Krug outlined steps that the board has taken to achieve what he said was the board's aim to give small business a square deal.

Mr. Krug said fourth quarter sheet and strip situation should be "very much improved because the third quarter is the seasonal high on the food container situation." He declared that controls will continue on the larger steel consumers, such as automobile, refrigerator and construction machinery manufacturers until the marginal supply of free steel is determined to be adequate for the production of civilian goods. Of the peak of 600 WPB orders Mr. Krug said that probably one-half will be needed during the war with Japan.

Based on average monthly war production amounting to $5,000,000,000, Mr. Krug said that cutbacks for the third and fourth quarters of this year will approximate 20 per cent and 30 per cent, respectively. With estimates for the first and second quarters of 1946 set at 36 per cent and 38 per cent, respectively. He also pointed out that the bulk of cutbacks for the next six months has been agreed to by the procurement agencies. By the first part of 1946, Mr. Krug declared, cutbacks will be sufficient to permit production of civilian goods at the prewar levels.

Describing the machinery WPB has set up to aid small business, Mr. Krug said that 82 per cent of the 175,000 concerns in the less than $50,000 quarterly sales bracket will be given priorities assistance under Priorities Regulation 27. Additional priorities assistance, Mr. Krug said, will be given plants producing more than $50,000 quarterly under Priorities Regulation 28, to be issued shortly.

Mr. Krug said that WPB intends that warehouses shall be sufficiently stocked with materials and components during the transitional period as a further means of assisting small business. Also, in order to cut down pre-emptive buying, Mr. Krug told the committee that WPB will intensify compliance surveys.

Senator Wherry, Republican of Nebraska inquired into the component situation and was told by Mr. Krug that where components are in tight supply WPB controls will be maintained.

Exception was taken by Senator Wherry, to Mr. Krug's statement that WPB cannot "wet nurse" 145,000 concerns. The Senator expressed the opinion that granting priorities assistance to small business was not "wet nursing."

Senator Murray, Democrat of Montana, committee chairman, said that small business men are complaining more than ever before about their inability to get steel and other materials. Mr. Krug replied that the relief that WPB has given the small business man "is being dissipated by the squeeze-out psychology."

There were differences of opinion as to the number of workers now unemployed as the result of cutbacks and delay in reconversion. Mr. Krug expressed surprise at the 3,000,000 figure cited by a committee member, emphatically challenging the accuracy of the figure. Mr. Krug estimated that less than 1,000,000 unemployed is more nearly correct.

Chicago Cutbacks Total 450 Millions Following VE-Day

Chicago

• • • **Cancellations of Chicago** Ordnance District contracts since VE-Day amount to approximately $450,000,000 according to Col. John Slezak, district chief.

New contracts let during May totaled over $145,000,000, $169,000,000 less than in April.

During May contractors within the district produced $146,747,000 worth of fighting equipment. This represents a decline of only $7,911,000 from April.

Col. Slezak declared that downward adjustments in the Ordnance Department's production schedule, made possible by the end of hostilities in Europe, may continue for some time.

The major share of the terminations and cutbacks ordered since May 8 will not show their full effect on the district's production until later this summer, the Colonel said. As examples, he cited that 2½-ton truck production at the Studebaker Corp. is not scheduled to end until July 31, nor is medium tank production at the Pressed Steel Car Co. scheduled to end until June 30.

Of the total terminations in the district since VE-Day, the ammunition branch had 142 contracts affected with $115,000,000 being removed from future production schedules. The artillery branch's terminations aggregated $35,000,000 while those in the tank-automotive branch topped $300,000,000. Terminations in small arms production have been negligible, Col. Slezak said.

Col. Slezak stated that in the Chicago Ordnance District during May a total of 328 new contract terminations were authorized against a total of 146 final settlements effected during the month. At the end of May the district had 376 cases pending final settlement against 200 a month earlier.

"Of the 376 pending cases only two are more than 90 days old," he said. "We are confident that we can settle these cases swiftly and efficiently as our termination organization has gained considerable experience through having already completed over 1900 separate cases.

"Governmental procedures for the handling of terminations have been clarified and coordinated in the joint termination regulations issued by the War and Navy Departments. These regulations are proving to be adequate and workable. The most serious obstacle to speedy settlements lies in a reluctance on the part of some manufacturers to prepare their own organizations for handling the mechanics of terminations."

AISI Reports Year Of Lowest Earnings In Steel Industry

New York

• • • **Steel companies earned** less money in 1944, greatest steel production year on record, than they did in any preceding war year, and far less than they earned in a good peacetime year like 1937, according to the American Iron & Steel Institute. Stockholders received in dividends about 80 per cent as much as they got in 1937, and only about half as much as in 1929.

Last year, companies accounting for nearly 90 per cent of total shipments of finished steel products, had a combined net income of $178,250,550 after meeting all charges but before paying dividends. That was a decline of about five per cent from the total of $188,591,832 earned by the same companies in 1943. Both figures include earnings from certain non-steelmaking activities, such as mining, transportation, shipbuilding and other activities.

In 1937, when steel output was 37 per cent less than in 1944, earnings of a similar group of companies were almost 30 per cent higher, amounting to about $230,000,000.

The companies earned last year about 4.7 per cent on investment, lowest of any war year and considerably below 1937. In 1941 earnings were highest **for the war period,** 8.1 per cent on investment, which compared with 6.2 per cent in 1937. In 1942, the return was 5.6 per cent while for 1943 it was 5.1 per cent.

A total of $118,953,000 in cash dividends was paid last year to the nearly half a million owners of the companies, about $23,000,000 or 16 per cent less than in 1943. In 1937, dividends exceeded $151,000,000.

Dividends paid to stockholders last year represented 4½c. for every dollar paid to employees. In 1943 stockholders received 5½c. in dividends per dollar of payrolls disbursed, and in 1937 they got 13½c. per dollar of payrolls.

A total of $6,613,461,000 in gross income was received by the steel companies in 1944, including income from non-steelmaking activities. That represented a decline of about $33,000,000 from 1943 income.

Payrolls (including those disbursed for non-steelmaking operations) increased by $58,000,000 and the cost of materials and other expenses rose $17,000,000. Payrolls amounted to $2,640,954,000 in 1944. A decline of $3,000,000 in depreciation and depletion charges was more than offset by a $19,000,000 rise in amortization of emergency facilities built during the war. Taxes were lower in 1944 than in 1943 chiefly because of reduced income and profits.

Steel Shipments By Consuming Industries
Source: American Iron & Steel Institute

	1945 (Net Total)
1. STEEL CONVERTING AND PROCESSING INDUSTRIES	
(a) Wire drawers and wire product manufacturers	156,295
(b) Bolt, nut, and rivet manufacturers	277,719
(c) Forging manufacturers	
(1) Automotive and Aircraft	150,293
(2) All other	402,699
(d) All other steel plants and foundries	500,480
Total	1,487,486
2. JOBBERS, DEALERS AND DISTRIBUTORS	
(a) Oil and natural gas industry	162,211
(b) All other	2,048,022
Total	2,210,233
3. CONSTRUCTION INDUSTRY	
(a) Public (Municipal, State, National)	33,094
(b) Highways	52,522
(c) Railways	12,682
(d) Automotive and Aircraft	21,553
(e) Utilities	47,368
(f) Building trim, accessories and builders' hardware	126,263
(g) All other	822,025
Total	1,115,507
4. SHIPBUILDING INDUSTRY	1,267,386
5. PRESSING, FORMING AND STAMPING INDUSTRY	
(a) Metal furniture and office equipment	40,901
(b) Hardware and household equipment	129,397
(c) Automotive	332,846
(d) All other	298,938
Total	802,082
6. CONTAINER INDUSTRY	
(a) Oil and natural gas industry	118,897
(b) All other	959,191
Total	1,078,088
7. AGRICULTURAL, INCL. IMPL. & EQUIP. MFRS.	243,068
8. MACHINERY AND TOOLS	
(a) Machinery and tools, not incl. electrical equipment	418,716
(b) Electrical machinery and equipment	199,231
Total	617,947
9. AUTOMOTIVE AND AIRCRAFT INDUSTRY	502,368
10. RAILROAD INDUSTRY	
(a) All railroads	904,460
(b) Car and locomotive builders and parts manufacturers	289,363
Total	1,193,823
11. OIL, NATURAL GAS AND MINING INDUSTRY	
(a) Oil and natural gas, including pipe lines	288,954
(b) Mining, quarrying and lumbering	57,531
Total	346,485
12. UNCLASSIFIED	876,144
13. MISCELLANEOUS INDUSTRIES AND EXPORT	3,673,434
14. Total (Items 1 to 13)	15,414,051

During 1944 the companies included above represented 99% of the total output of finished rolled products.

Navy Requirements Sustained In All Lines Except Shipbuilding

Pittsburgh

• • • **While there have** been substantial cutbacks in Army requirements in this area, the Navy has cancelled very few of its contracts. This area, aside from shipbuilding, is not one in which there is a very extensive Naval procurement program, and it has only been in shipbuilding that the Navy has made cutbacks. There was no letup in industrial production for the Navy anticipated with the cessation of hostilities in Europe. However, the overall Naval procurement picture will reflect some decline since some war materials have been procured by the Navy for the Army, and vice versa.

In winding up the second quarter of this year, production for the Navy is still at peak levels and slightly greater than the $4,100,000,000 program of the first quarter. The accelerated maintenance program has compensated largely for the decrease in expenditures for new construction.

Naval aviation procurement is expected to be modified only slightly, a contrast to that of the Army. In 1945, purchases of about 26,000 aircraft are expected, and, the end of the war in Europe caused a decline in estimated eventual requiremenis of only 941 planes or less than 4 per cent of requirements.

Despite high production, the Navy is still in a critical position in its requirements for electrical parts, rockets, internal combustion engine parts, maintenance parts for aircraft, and equipment for Advance Base work.

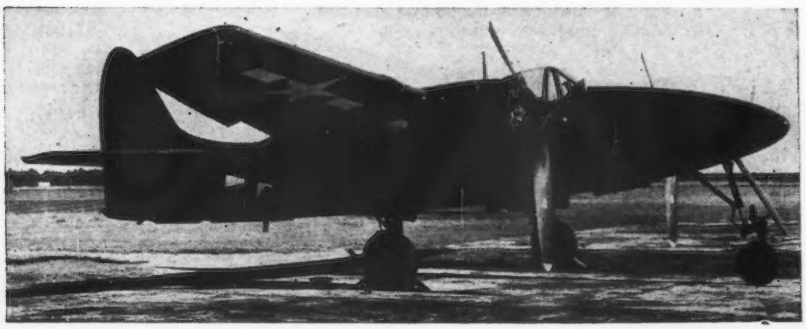
The Pittsburgh area saw two major and one minor contract terminations by the Navy, all three of which were for landing craft. Dravo and American Bridge Co., both large builders of landing craft, completed their contracts recently, while Pittsburgh Des Moines Steel Co., a smaller producer of landing craft, terminated its work several months ago.

Shortages of Naval requirements now are due in a large measure to manpower shortages, which are generally localized and somewhat confined to certain skills. More than 600 suppliers of all types of Naval equipment reported that they were behind schedule during the first quarter because of the scarcity of workmen. These 600 companies need about 55,000 employees to meet production schedules.

Now that attention can be directed wholly to the Pacific war, it is expected that Naval material will be expanded at an accelerated rate. Following is the estimated value of the 1945 Navy production program by quarters, with 1944 actual expenditures shown for comparison.

1945	Expenditures (estimated)
1st quarter	$4,155,200,000,000
2nd quarter	4,225,000,000,000
3rd quarter	4,095,800,000,000
4th quarter	3,790,400,000,000
Total, 1945	$16,266,400,000,000
Total, 1944 (actual)	$18,912,000,000,000

NAVY TWO ENGINE: *The F7F Tigercat, Grumman-built fighter bomber, is the fastest climbing and newest Navy craft. Recently launched has been the first of a new class of 45,000 ton carriers, designed to carry "a new type of twin engine airplane." The Tigercat is presumably the plane to be so used.*



Sheet Easement Seen by Committee

Washington

• • • **Expectation of a** substantial change in the next three or four weeks, the result of military cutbacks, that will ease the present tight position of sheet steel was expressed at a recent meeting of the steel sheet and strip industry advisory committee.

Both committee members and WPB officials agreed about the probable availability of sheet steel during the third quarter inasmuch as cutbacks have not been reflected at the mill level. The committee said that as yet there had been few cancellations of orders as the result of cutbacks and that order books for hot rolled pickled and cold rolled sheets are filled up through the third quarter with validated CMP orders.

A military representative at the meeting reported that the one-front war military requirements involving light gage sheet and strip were only slightly less than the two-front war requirements. Industry members reported a continuation of their efforts to increase production, but said that the necessary manpower had not yet been obtained.

Chrysler Hit by CIO And AFL Jurisdictional Disputes

Detroit

• • • **Jurisdictional arguments** between CIO and AFL unions (THE IRON AGE, June 14, 1945, page 82) closed down reconversion construction work at three Chrysler Corp. plants.

First to be affected was the Dodge Truck plant, where a small number of AFL building trades men walked off a $2,500,000 addition last week.

Their position was that unless they could be guaranteed the finishing of the entire job, they would not work on it. A similar position led to this week's walkouts on two additions to the Jefferson-Kercheval plant of the Chrysler Division and on two others at the Plymouth plant.

Matters appeared to be at a stalemate early in the week. The contractor companies, using all Federation workers, were unable to go on with their work, and Chrysler Corp. organized under the CIO United Workers Union, was unable to do the construction work itself with its own maintenance men, even if it wanted to take that course of action. Federal intervention was expected.

Doxey Says CMP Authorizations Will Replenish Third Quarter Stocks

Washington

• • • **President Walter S. Doxey** of the American Steel Warehouse Association, Cleveland, told the Senate Small Business Committee on June 19 the CMP authorizations accumulated during the second quarter of 1945 will assure replenishments to warehouses during the third quarter. Beginning with the fourth quarter, Mr. Doxey said, replacements appear less certain. This was attributed to the fact that on and after July 1 "warehouses may—but do not have to—make sales to one and all on unrated orders and they will have to replace the steel so sold by ordering from their sources on an unrated basis."

If PR 27 functions as intended, it was pointed out, a reasonable supply of steel should be available to warehouses and to small business enterprises that are their principal customers. Beginning July 1, this regulation gives priorities to companies whose sales of manufactured articles do not exceed $50,000 in a three month period. Warehouses receiving orders from such companies, Mr. Doxey explained, may extend these priorities, along with CMP authorizations, to obtain stock replenishments.

Mr. Doxey said that within reasonable ranges, experience over a period of years has demonstrated that during peace and war, prosperity and depression, certain percentages of steel mill products will be required to serve small business institutions and the repair and emergency needs of both small and large enterprises. For example, Mr. Doxey citing American Iron and Steel Institute figures, said that during the three prewar years, 1939, 1940 and 1941, the average yearly receipts of structural shapes by warehouses was 387,000 tons or 10.7 per cent of the average yearly production and in the three war years, 1942, 1943 and 1944, the mills shipped an average of 465,000 tons each year to warehouses, 10.6 per cent of their average production in these war years.

Generally speaking, Mr. Doxey said, most warehouse distributors feel well satisfied with WPB regulations, as well as with their experiences with steel producers.

Partial reconversion in the period between VE-Day and VJ-Day, Mr. Doxey declared, will bring many perplexing problems to industry. One such problem, he said, concerned the importance of avoiding a check in the flow of essential materials so that instead of assisting small companies "we may actually harass and handicap them" by shutting off steel to manufacturers who make equipment such as motor trucks and machine tools for small enterprises.

After the war requirements have been served, Mr. Doxey said, it may confidently be expected that steel warehouses will distribute the remainder of their stocks with fairness among their many customers in order to expedite reconversion processes.

"Because," he concluded, "in numbers and in volume of business the small manufacturers and fabricators normally constitute the principal customers of warehouses there is little likelihood that these steel distributers will sell large quantities from their stocks to their large customers on unrated orders, thus quickly depleting their inventories with litte or no hope of equally rapid replacements."

CIO-USWA and Alcoa Sign Wage Contract

Pittsburgh

• • • **A new contract,** the first to be negotiated since the merger of the steel and aluminum unions and representing what the CIO-USWA terms as the "best conditions ever obtained for workers in the aluminum industry," was signed last week by the Aluminum Co. of America and CIO-USWA. The new agreement covers 35,000 workers in 19 Alcoa plants, and is effective until Dec. 6, 1946. It replaces one which expired a year ago but which was continued until the present time because of 17 disputed issues, which only recently were resolved by the National War Labor Board.

Major changes contained in the new contract include: 1. An increase in all shift differential pay. 2. The right of the union to approve or reject any rate changes proposed by the company. 3. Job rate guarantees for specified periods, when employees are either promoted or demoted. 4. Four hours "show-up" time when no work is available on scheduled days. 5. The right of union officials to investigate grievances inside the plants. 6. A number of clauses providing for greater union security.

In accordance with the WLB directive, a new wage structure for all of the company's plants will be discussed and negotiated. Other provisions call for improved seniority protection, including hiring, reduction of forces, new jobs, vacancies, job assignments, and lines of progression for promotions and demotions. Overtime payments were clarified and will be increased as soon as government restrictions are removed. Improved provisions were made for employees in military service.

Plants covered by the agreement are: Alcoa, Tenn.; Badin, N. C.; Bauxite, Ark.; Brookfield, Ill.; Canonsburg, Pa.; Detroit, Mich.; Drury, Ark.; Edgewater, N. J.; Fairfield, Conn.; Hurricane Creek, Ark.; Jones Mill, Ark.; Mead, Wash.; Mobile, Ala.; Monroe, Mich.; Newark, Ohio; New Kensington, Pa.; Phoenix, Ariz.; Trentwood, Wash.; and Troutdale, Ore.

CMP Controls Will Be Retained Until Jan. 1

Washington

• • • **Extension of CMP** controls through the end of 1945 instead of Sept. 30, as originally planned, is reported to have been decided upon by WPB's Committee on Period One.

This, it is said, may have the effect of bringing increased pressure to bear for additional programming of civilian production such as washing machines and refrigerators which are now under program controls.

It is also reported that WPB will announce a new allocations system covering metals not now covered by CMP. This will probably include zinc, lead and tin and will be administered on a monthly basis.

A certain quantity of such metals is expected to be earmarked for essential users, the balance to be handed out on an unrated basis, it is said.

Four Sales Involving Surplus Machine Tools Net the RFC $983,000

Cleveland

• • • **Further indication** of reconversion's rising tide came to light last week when it was learned that four sales involving more than $1,500,000 worth of machine tools to four different lessees had been made recently in this area through the local disposing loan agency of the Reconstruction Finance Corp.

These sales, which net RFC $983,000, represented, it is hoped, a sizable omen in the trend toward surplus property, and confirms the statement of F. E. Brickel, assistant manager of RFC's Cleveland Region, who is in charge of surplus property, to the effect that lessees are interested in purchasing a major portion of the facilities and production equipment they are now leasing, evidenced by the fact that the Timken Roller Bearing Co., Addressograph-Multigraph Corp., National Cash Register Co., and Hobart Mfg. Co., have stepped ahead and bought.

Sold under what has since become the new Regulation (No. 6) to the Surplus Property Act, permitting contractors to purchase these government-owned machine tools and equipment necessary to peacetime production at once, although their exclusive use on government contracts may continue for some time, these tools were priced under existing SPB regulations and were subject to internal review by the owning agency (Army, Navy, etc.). Sales to lessees in possession may now be effected under the new Regulation 6.

Timken Roller Bearing Co., Canton, purchased 266 units, original cost of which was $884,000,000. Of this amount, the RFC's net was $498,000,000, which will be turned over to the SPB. As might be readily surmised, these tools have been used in the manufacture of bearings and will doubtless continue in that capacity.

Addressograph - Multigraph Corp., Cleveland, who has been making ammunition components for the Army, bought 120 units at a cost of $216,000. This was just the agency's net, however, since the value of the tool involved was $317,000.

National Cash Register Co., Dayton, bought only 23 items, mostly millers and profilers, for an expenditure of $71,000. Original cost of these items was approximately $123,000.

Hobart Mfg. Co., Troy, Ohio, bought 103 tools, including milling machines and grinders, costing originally $358,000. Net to RFC was $198,000.

According to Mr. Brickel, inquiries have been the heaviest for standard, general purpose machine tools, which, of course, have not yet been declared surplus. Most of the tools now declared surplus by the owning agency are more or less of a specialized type, such as gun boring lathes and rifling machines.

At the present time, interest in special purpose equipment, unless a manufacturer plans to continue in the same line after the war, as in the case of a crankshaft manufacturer, is limited and there is already an estimated inventory of $7,000,000 of equipment of this type, and RFC officials feel that a good share of this will be sold by sealed or open bid on location.

Agency officials are quick to point out that any individual sale amounting to more than $1,000,000 is subject to review by the attorney general's office, and in this vein it has been reported that several sales of approximately this size are pending.

Subsidiaries of U.S. Steel Planning Large Tinplate Expansion

Pittsburgh

• • • **A program** of expansion has recently been announced by J. L. Perry, president of Carnegie-Illinois Steel Corp., which will go into effect as soon as materials and labor are available.

Mr. Perry said the program will increase Carnegie's capacity for cold reduced tinplate products in the Pittsburgh and Chicago areas by a total of 233,000 tons annually. The company also will rebuild and enlarge one blast furnace at Gary, Ind., and two at South Chicago, Ill., and will replace ore and coke pockets at the South Chicago furnaces. After rebuilding, these blast furnaces will be the largest in the country.

In the Pittsburgh district the cold reduced tinplate capacity of Irvin Works will be increased by approximately 129,000 tons annually.

In the Chicago district the cold reduced tinplate capacity will be increased approximately 104,000 tons annually by the installation of new equipment at the Gary sheet and tin mill.

At Gary Works the No. 6 blast furnace will be rebuilt and enlarged from a daily rated capacity of 870 tons to 1508 tons per day. The rebuilding will include new stoves, additional gas washing capacity and other auxiliaries for the larger furnace, as well as a belt conveyor coke handling system and other stock house, iron and cinder handling equipment. The No. 6 blast furnace was built in 1910 and last completely relined in 1928.

At the South Chicago plant, blast furnaces 7 and 9 will be completely rebuilt and enlarged and ore and coke pockets at blast furnaces 5 to 10 will be replaced. The No. 7 furnace, built in 1910, has a rated capacity of 676 tons per day and was last completely relined in 1922. It has not been operating since July 3, 1944. The No. 9 furnace, built in 1909, has a rated capacity of 713 tons per day and was last completely relined in 1930. It is expected to continue in operation until Sept. 1, 1945. After rebuilding, each of these furnaces will have a daily rated capacity of 1508 tons.

Another new tinplate improvement program has been announced by Robert Gregg, president of Tennessee Coal, Iron & Railroad Co., Birmingham, Ala. This project contemplates an increase in tinplate capacity in the Fairfield tinplate mill and the installation of feeders and cleaners for 28 tin stacks. The increase in capacity will be approximately 52,000 tons annually.

These improvements are a continuation of the prewar trend toward improved facilities to meet the change in trade demands from the old style hot reduced to the more modern cold reduced product, and are expected to help the U. S. Steel subsidiaries more adequately meet the needs of tinplate users in the postwar period.

Terminates Aircraft Engine Job

Muskegon, Mich.

• • • **Preparations for** manufacture of the Pratt & Whitney model R-985 aircraft engine at Continental Aviation & Engineering Corp. have been stopped as a result of termination of the Air Forces contract for the job. The cancellation totaled approximately $10,000,000, including not only the engines but also spare parts for the R-985 and R-1340 engines, the latter having been previously canceled.

O'Mahoney Disposal Report Reveals Steel Expansion Data

Washington

• • • **Taking cognizance of** the urgency of the plant disposal problem in connection with curtailed operation of western steel plants, Senator O'Mahoney of the Military Affairs Committee, presented a report recently summarizing the scope and significance of wartime expansion in the steel industry. Particular attention is paid in the report to the market factors upon which will hinge the future of operations of plants erected out of military necessity during the war.

The report takes note of the fact that detailed plans have not yet been worked out for the disposal of surplus iron and steel plants, and warns that if such preparations are not made promptly the plants will actually be declared surplus before action is taken. It is noted that the present order situation on the West Coast indicates a shutdown of plate mills by the end of August, and that structural mills at Geneva are already closed down.

According to the report of the committee if proper preparations are not made in advance, the intentions of Congress last year in passing the Surplus Property Act will have been ignored by the Surplus Property Board.

The report was prepared by the staff of the War Contract Subcommittee in cooperation with the staff of the Special Committee on Postwar Economy Policy and Planning.

The maps, charts, and figures included in this statement, unless otherwise indicated, were selected from a report submitted by the Bureau of Foreign and Domestic Commerce, in answer to a request of the War Contracts Subcommittee.

The significant basic data derived from the reports of the Departments of Commerce and the Interior, and other reports and publications, may be summarized as follows:

In 1944, steel was the most important of all processed metallic and nonmetallic basic materials used by manufacturing industries in the United States, accounting on a tonnage basis for about 85 per cent of the total, while light metals accounted for only about 1.8 per cent.

In comparison with other manufacturing industries, the iron and steel industry is first in terms of assets and value added by manufacture, and second to food only in terms of value of product and sales and receipts. Except during the war when planes, ships, and other transportation equipment overtook the steel industry, it employed more workers and paid more wages than any other industry.

The United States is by far the largest steel producer in the world, and its predominance has increased vastly during the war.

Since 1938 steel ingot capacity has increased between 16 and 17 per cent from approximately 82,000,000 net tons to approximately 96,000,000 net tons.

The cost of this increase amounted to more than $2.5 billion, of which government-owned facilities account for slightly over 50 per cent.

Except for extensive conversions from continuous strip mills to the rolling of plates for war demand (easily reconvertible to former products), there has been no marked change in relative product capacity.

Over the last 20 years the peacetime demand for steel has shifted from heavy steel products, such as rails, plates, and beams, to light flat rolled products required by the makers of automobiles, refrigerators, and containers.

Except for close-to-capacity operations during the two world wars, the steel industry has operated far below capacity. During the 1930's average utilization of capacity was approximately 50 per cent.

The volume of steel production has borne a close relationship to the level of the gross national product. Assuming a continuation of this relationship, a gross national product of almost $200,000,000,000 in terms of the 1945 dollar value would be required, according to the Commerce Department calculations, for full utilization of present steel capacity.

Alloy steel production for special war needs increased almost 800 per cent between 1938 and 1943, and the capacity of electric furnaces required for high-quality alloy steel rose 287.5 per cent. In 1943 alloy steel output amounted to 15 per cent of total steel output in comparison with 5 per cent in 1938.

While the overall ingot capacity of the United States increased by 16.8 per cent, the capacity in the 11 Western States increased by about 130 per cent. West of the Rocky Mountains, the increase was almost twice as great.

The newly constructed western plants were designed to produce steel products needed for shipbuilding, such as plates and structural products. Considering the different demands of a peacetime western economy, the West appears to have excessive capacity to produce plates and structural products while there is little or no rolling capacity in the Far West to fill a large demand for light flat rolled, and tubular products.

Before the war, the three West Coast States consumed over 80 per cent of the steel consumed in the 11 Western States. California alone accounted for about 70 per cent.

A large part of the steel consumed at or near Pacific ports where the major western markets are located, was shipped there by water. This fact indicates that inbound water shipments will be a major factor in assessing the competitive prospects in these markets of the postwar western steel industry.

The present high level of commercial freight rates for steel products from Geneva, Utah, will seriously af-

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• • • This Iron and Steel Plants Disposal Report was prepared for the Senate Committee on Military Affairs by the staff of the War Contract Subcommittee in cooperation with the Special Committee on Postwar Economy Policy and Planning.

Maps, charts and figures unless otherwise indicated were prepared by the Bureau of Foreign and Domestic Commerce, Department of Commerce. . . .

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fect that plant's competitive position in the western markets.

In the light of these basic data and the objectives of the Surplus Property Act, a number of questions have been prepared concerning the policy to be developed with respect to the disposal of government-owned iron and steel plants, which the sub-committees desire to direct to the executive agencies responsible for the administration of the Surplus Property Act.

1. What disposal policy, if any, can achieve fuller utilization of our productive steel capacity?

This issue goes to the heart of the disposal problem.

The following basic data are relevant to its discussion:

(*a*) During the 10-year period from 1930 to 1940, the utilization of our then existing capacity averaged about 50 per cent, varying from a low of 22 per cent in 1932 to a high of 74 per cent in 1937.

(*b*) During the war our capacity has increased by 16.8 per cent, or from approximately 82,000,000 to 96,000,000 net tons.

(*c*) The demand for finished steel products is a derived demand. That means it is derived from the markets which exist for the finished products of numerous steel-consuming industries.

(*d*) According to Department of Commerce calculations based on a mathematical relationship between the volume of steel production and the level of the gross national product, a gross national product of almost $200,000,000,000 would be required for full utilization of present steel capacity.

What does this imply concerning the effectiveness of any particular disposal policy? Can disposal be made to contribute effectively to a fuller utilization of our present capacity?

2. If any existing trade practices in the industry have prevented such fuller utilization, what disposal policy, if any, will be able to overcome the adverse effects of such practices?

While it must be recognized that the demand for finished steel products depends largely on our general economic well being, have trade practices in the industry contributed to the industry's history of low level utilization of its productive capacity? If any practices are found to do so, can any particular disposal policy overcome the adverse effects of such practices?

3. If it develops that our present capacity exceeds the probable postwar demand for steel, what disposal policy shall be adopted with respect to government-owned steel plants?

4. Notwithstanding possible excess steel capacity, what shall be the disposal policy if it is found that some government-owned plants can produce steel at a lower cost than industry-owned plants?

Would public policy require that low-cost plants be continued in operation? Should it be a part of disposal policy to assure passing on to the consumers the benefits of such low-cost production? If government plants are found to be non-

TABLE I

Summary[1] of necessity certificates authorized for producers of basic and semi-finished steel products, September 1940—March 1945[2]

	Number	Value (thousands of dollars)
Companies with certificates aggregating $1,000,000 and over	1,273	728,980
Companies with certificates less than $1,000,000	3,647	106,953
Total	4,920	835,933

[1] Abstracted from a compilation prepared by the Facilities Branch of the Bureau of Program and Statistics, War Production Board, showing the number and value of necessity certificates authorized for producers of basic and semifinished steel products, September 1940–March 1945.

[2] Facilities include iron ore and coal mines, coke ovens, blast furnaces, open-hearth and electric furnaces, rolling mills, finishing mills, foundries and forge shops, and facilities incidental to the operation of the foregoing, except transportation facilities.

Company and location:	Value (thousands of dollars)
Acme Steel Co., Chicago, Ill	4,332
Allegheny Ludlum Steel Corp., Brackenbridge, Pa	4,821
American Brake Shoe Co., Baltimore, Md	4,544
American Cast Iron Pipe Co., Birmingham, Ala	2,679
American Rolling Mill Co., Ashland, Ky	25,293
American Steel Foundries, Alliance, Ohio	6,278
Babcock & Wilcox Co., Alliance, Ohio	5,440
Blaw Knox Co., Blawnox, Pa	2,170
Bethlehem Steel Co., Barrackville, W. Va	175,204
Canton Drop Forgings & Manufacturing Co., Canton, Ohio	1,600
Carpenter Steel Co., Reading, Pa	3,221
Chapman Valve Manufacturing Co., Indian Orchard, Mass	1,479
Cleveland Cliffs Iron Co., Gwinn, Mich	4,964
Cold Metal Products Co., Youngstown, Ohio	1,243
Colorado Fuel & Iron Corp., Pueblo, Colo	6,337
Continental Foundry & Machine Co., Coraopolis, Pa	2,085
Copperweld Steel Co., Warren, Ohio	5,244
Crucible Steel Co. of America, Harrison, N. J	10,828

Company and location—Continued.	Value (thousands of dollars)
Donner Hanna Coke Co., Buffalo, N. Y	4,353
Eastern Gas & Fuel Associates, Boston, Mass	5,187
Falk Corp., Milwaukee, Wis	2,824
Follonshee Steel Corp., Follonshee, W. Va	2,337
General Motors Corp., Saginaw, Mich	2,656
General Steel Castings Corp., Eddystone, Pa	982
Great Lakes Steamship Co., various	4,100
Heppenstall Co., Bridgeport, Conn	1,127
Inland Steel Co., Indiana Harbor, Ind	14,628
Jones & Laughlin Steel Corp., Aliquippa, Pa	29,350
Kaiser Co., Inc., Kelso, Calif	82,051
Keystone Steel & Wire Co., South Bartonsville, Ill	1,053
Lebanon Steel Foundry, Lebanon, Pa	1,594
Lukens Steel Co., Coatesville, Pa	3,552
National Forge & Ordnance Co., Irvine, Pa	2,556
National Malleable & Steel Casting Co., Cicero, Ill	3,074
National Steel Corp., Jackson, Mich	32,218
National Supply Co., Ambridge, Pa	1,974
Park Drop Forge Co., Cleveland, Ohio	3,371
Pittsburgh Steel Co., Allenport, Pa	1,733
Republic Steel Corp., Birmingham, Ala	23,992
Rustless Iron & Steel Corp., Baltimore, Md	3,498
Semet Solvay Co., Ashland, Ky	6,366
Sharon Steel Corp., Sharon, Pa	2,540
Sloss Sheffield Steel & Iron Co., Bessemer, Ala	2,031
Spicer Manufacturing Co., Buffalo, N. Y	1,484
Stanley Works, Bridgeport, Conn	1,070
Steel Improvement & Forge Co., Cleveland, Ohio	1,515
Symington-Gould Corp., Depew, N. Y	1,559
Tube Reducing Corp., Wallington, N. J	1,636
United Engineering & Foundry Co., Pittsburgh, Pa	1,475
United States Steel Corp., Ambridge, Pa	178,007
Valley Mould & Iron Corp., Chicago, Ill	1,996
Warren Foundry & Pipe Corp., Mount Hope, N. J	2,874
Williams, J. H. & Co., Tonawanda, N. Y	1,345
Wood, Alan Steel Co., Conshohocken, Pa	4,368
Woodward Iron Co., Bessemer, Ala	2,902
Wire Rope Corp. of America, Inc., New Haven, Conn	1,912
Wheeling Steel Corp., East Steubenville, W. Va	4,013
Wyman-Gordon Co., Harvey, Ill	7,196
Youngstown Sheet & Tube Co., Campbell, Ohio	8,719
Total	728,980

TABLE II

Breakdown of additions to annual productive capacities of 12 leading steel companies[1] according to industry-owned and government-owned additions, 1938-45

[Millions of net tons]

Company	Byproduct coke ovens				Blast furnaces			
	Private	Percent of total addition	Government	Percent of total addition	Private	Percent of total addition	Government	Percent of total addition
United States Steel Corp.	(2)	(2)	1.40	100.0	1.30	33.1	2.63	66.9
Bethlehem Steel Co.[3]	1.15	100.0	(4)	(4)	2.44	100.0	(4)	(4)
Republic Steel Corp.	.26	13.5	1.67	86.5	.44	21.6	1.60	78.4
Jones & Laughlin	(2)	(2)	(4)	(4)	.20	100.0	(4)	(4)
National Steel Corp.	.30	100.0	(4)	(4)	.84	100.0	(4)	(4)
Youngstown Sheet & Tube Co.	(2)	(2)	(4)	(4)	.27	100.0	(4)	(4)
Inland Steel Co.	.09	9.6	.85	90.4	.59	39.6	.90	60.4
American Rolling Mill Co.	.20	42.6	.27	57.4	.53	66.3	.27	33.7
Wheeling Steel Corp.	(2)	(2)	(4)	(4)	(2)	(2)	(4)	(4)
Colorado Fuel & Iron Co.	(2)	(2)	.33	100.0	.16	100.0	(4)	(4)
Pittsburgh Steel Co.	(2)	(2)	(4)	(4)	(5)	(4)	.43	100.0
Crucible Steel Co.	.02	100.0	(4)	(4)	.02	100.0	(4)	(4)

Company	Open-hearth furnaces				Bessemer furnaces			
	Private	Percent of total addition	Government	Percent of total addition	Private	Percent of total addition	Government	Percent of total addition
United States Steel Corp.	2.79	48.0	3.02	52.0	(2)	(2)	(4)	(4)
Bethlehem Steel Co.	1.28	81.0	.30	19.0	(2)	(2)	(4)	(4)
Republic Steel Corp.	(2)	(2)	.57	100.0	0.16	100.0	(4)	(4)
Jones & Laughlin	1.08	100.0	(4)	(4)	(2)	(2)	(4)	(4)
National Steel Corp.	.09	100.0	(4)	(4)	(5)	(5)	(4)	(4)
Youngstown Sheet & Tube Co.	.88	100.0	(4)	(4)	(2)	(2)	(4)	(4)
Inland Steel Co.	.31	100.0	(4)	(4)	(5)	(5)	(4)	(4)
American Rolling Mill Co.	.22	41.5	.31	58.5	(5)	(5)	(4)	(4)
Wheeling Steel Corp.	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Colorado Fuel & Iron Co.	.13	100.0	(4)	(4)	(5)	(5)	(4)	(4)
Pittsburgh Steel Co.	.17	70.8	.07	29.2	(5)	(5)	(4)	(4)
Crucible Steel Co.	.09	100.0	(4)	(4)	(5)	(5)	(4)	(4)

Company	Electric furnaces				Total steel capacity			
	Private	Percent of total addition	Government	Percent of total addition	Private	Percent of total addition	Government	Percent of total addition
United States Steel Corp.	0.179	52.0	.165	48.0	2.42	43.1	3.19	56.9
Bethlehem Steel Co.	.13	100.0	(4)	(4)	1.35	81.8	.30	18.2
Republic Steel Corp.	.501	31.9	1.068	68.1	.04	2.4	1.64	97.6
Jones and Laughlin	.007	100.0	(4)	(4)	.91	100.0	(4)	(4)
National Steel Corp.	(2)	(2)	(4)	(4)	.09	100.0	(4)	(4)
Youngstown Sheet & Tube Co.			.12	100.0	.51	81.0	.12	19.0
Inland Steel Co.	(2)	(2)	(4)	(4)	.31	100.0	(4)	(4)
American Rolling Mill Co.	(4)	(4)	.05	100.0	.22	37.9	.36	62.1
Wheeling Steel Corp.	(5)	(5)	(4)	(4)	(4)	(4)	(4)	(4)
Colorado Fuel & Iron Co.	(5)	(5)	(4)	(4)	.13	100.0	(4)	(4)
Pittsburgh Steel Co.	(5)	(5)	(4)	(4)	.17	70.8	.07	29.2
Crucible Steel Co.	.273	80.1	.068	19.9	.36	83.7	.07	16.3

[1] Those companies with annual steel ingot (and castings) capacity of 1,000,000 net tons or more.

[2] Indicates net decrease in rated capacity of private facilities. There were, during this period, considerable expenditures by the industry for the modernization of existing equipment and the construction of new facilities. However, because of the elimination of some old capacity, the net result was in many cases a decrease in the total capacity of the company, or a net increase lower than the total of the new plant added.

[3] Privately financed facilities include byproduct coke ovens (800,000 tons) and blast furnaces (980,000 tons) originally financed by Defense Plant Corp. and subsequently purchased by Bethlehem Steel Co.

[4] Indicates no changes in privately financed facilities, or no additions of Government financed facilities.

[5] Indicates no existing facilities.

Source: Department of Commerce, Bureau of Foreign and Domestic Commerce.

competitive solely because of high wartime capital costs, should the government in formulating a disposal policy take any compensatory action?

5. What should be the disposal policy if these benefits of lower prices (referred to in the previous question) can be made available only after alterations have been made in any given government-owned plant?

This issue is closely related to the previous one. If alterations are required for postwar operation of government-owned plants, what effect should this factor have on government disposal policy? In order to discuss intelligently the policy with respect to plant alterations, is it not imperative to have specific knowledge of the facilities which are required, the structural alterations necessary, their cost, and the operating cost of the facilities after alterations as compared with the operating cost of competing companies?

6. What disposal policy will carry out most effectively the mandate of the act (*a*) to discourage monopolistic practices; (*b*) to foster the development of new independent enterprise; and (*c*) to strengthen and preserve the competitive position of small business concerns?

7. If in particular marketing areas the expansion of steel-consuming industries is dependent upon the assurance of availability of steel products at low prices, what disposal policy, if any, should be adopted in that regard?

8. In the light of the findings to the above questions, what should be the appropriate instrument of disposal for each particular property?

Will the traditional legal forms of sale or lease fit the needs of each particular case or will special innovations be required in order to achieve our postwar objectives?

Conclusions — It is apparent that the iron and steel industry occupies a position of great importance in the nation's economy. Because of its importance it is imperative that a careful analysis be made of the causes of its history of far below capacity operations. On the basis of this analysis it must be determined whether and

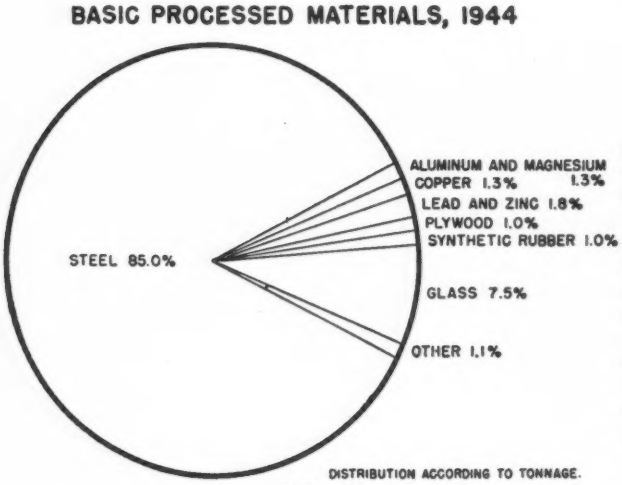


FIG. 1

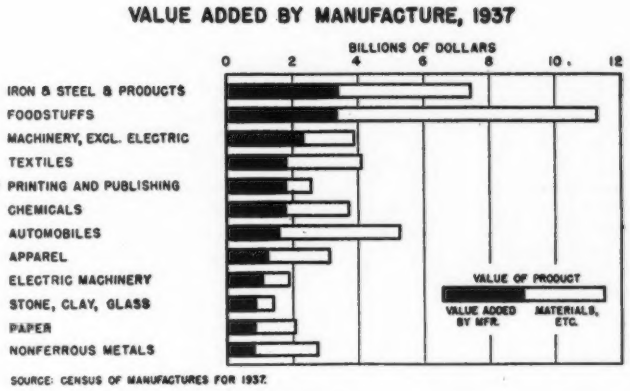


FIG. 2

how the disposal of government-owned iron and steel plants can contribute to the fuller utilization of the industry's productive capacity.

It is furthermore apparent from the statement of the issues that a great deal more specific information will be required before the problem of fuller utilization can be properly resolved. The first progress report pointed to the imperative need for market studies. We must know much more about likely postwar demand for steel and the relative efficiency of government-owned plants. Specifically required is information as to the types of steel products required for domestic consumption, for exports, and in particular domestic marketing areas; the need for alterations in particular government-owned plants to meet postwar demands; the cost of such alterations; the cost of assembled raw materials, cost of operations and cost of distribution of particular government-owned plants, as compared with privately owned plants, and the possibility of lowering such costs where necessary in order to be competitive.

If the objectives of the Surplus Property Act are to be achieved, this information, which is costly to secure and which is confined now to the knowledge of several government agencies and a small number of companies which have first hand knowledge on the basis of past operations, must be made accessible to all those who might possibly be interested in the utilization of these plants. The securing of this information is the joint responsibility of the Surplus Property Board and the Defense Plant Corporation.

On the basis of such information, it should be possible to formulate a disposal plan for government-owned iron and steel plants designed to achieve the long-run objectives of the act. This plan must set forth with definiteness what disposal of the key government-owned plants is recommended. The plan must be prepared in advance of disposal and on the basis of the objectives of the act. It must not be confined to a mere listing of bids which may have been received and then suggest in each instance a choice of the lesser evil.

In order to stimulate the formulation of such plan, some of the basic information not hitherto generally available follows.

Figures 1 to 4 are designed to bring into proper perspective the relative position of the iron and steel industry in our national economy and to show its size in comparison with foreign steel industries.

Figure 1 demonstrates the truth of the statement that ours is a steel age.

During 1944 approximately 110,-

FIG. 3

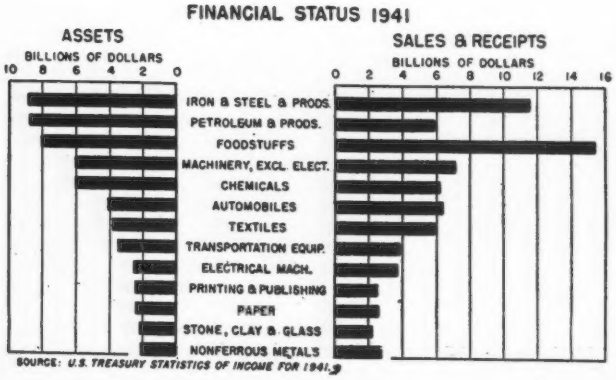
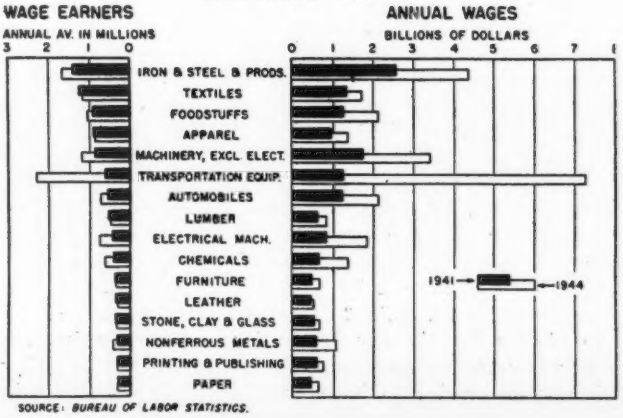


FIG. 4



000,000 tons of processed metallic and nonmetallic basic materials were used by manufacturing industries in the United States. On a tonnage basis, steel accounted for about 85 per cent.

It is notable that the light metals, aluminum and magnesium, accounted for less than 2 per cent. There has been much speculation about postwar displacement of steel by light metals. It can be seen from this exhibit that if all light metals which we have the present capacity to produce, were to be used in lieu of steel, such a development would still have a relatively small effect on overall steel consumption.

Figures 2, 3, and 4 show the relative position of the steel industry in comparison with other manufacturing industries.

Figure 2 demonstrates that in 1937 the iron and steel industry was the principal manufacturing industry in the United States, measured in terms of value added by manufacture. In terms of value of product, iron and steel was second only to food.

Figure 3 shows the financial status of the steel industry in 1941. It demonstrates that in that year the iron and steel industry represented more assets than any other manufacturing industry, and was second only to the food industry in sales and receipts.

Figure 4 shows the relative employment status of the steel industry in the national economy.

In 1941 the iron and steel industry employed more workers and paid out more dollars in wages than any other industry in the United States.

In 1944 the war-swollen transportation equipment industry, which includes airplane, ship, and tank building, employed considerably more workers and paid a higher wage bill than did the wartime iron and steel industry. It is reasonable to assume, however, that the relative position of the transportation equipment industry achieved during the war will not be maintained in a peacetime economy.

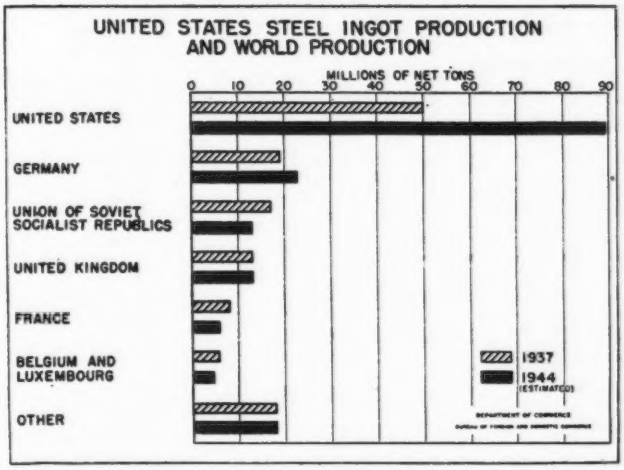
Figure 5 shows the relative position of the United States steel industry in comparison with world production.

This figure demonstrates that before the war the United States was by far the largest steel producer in the world, and that its position of predominance has increased vastly during the war.

Table III
Capacity (in millions of tons)

	June 30, 1938	End of Expansion	Per Cent Increase
By-product coke ovens	51.4	56.3	9.5
Blast furnaces	56.9	70.4	23.7
Open hearth furnaces	73.3	83.7	14.2
Bessemer furnaces	7.2	6.0	[1]—16.7
Electric furnaces	1.6	6.2	287.5

[1] Decrease.



ABOVE
FIG. 5

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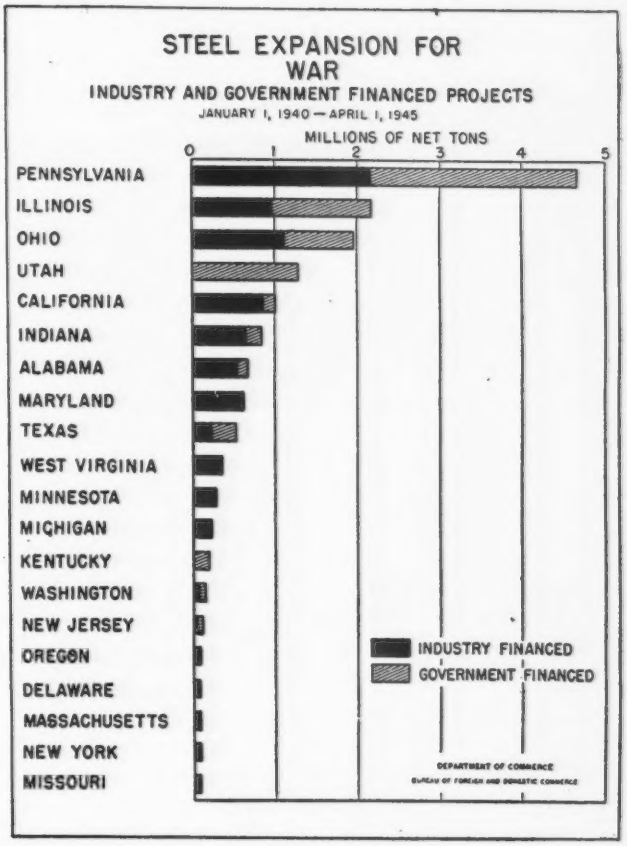
RIGHT
FIG. 6



Between Jan. 1, 1940, and April 1, 1945, close to $2,000,000,000 were spent on the expansion and modernization of our iron and steel-making facilities. If facilities auxiliary to the iron and steel industry proper, such as forge shops, foundries, facilities for ferroalloy, coke, refractory and flux, ingot mold, and scrap, are included, the total investment amounts to slightly more than $2.5 billion. Government-owned plants and facilities account for a little over 50 per cent of this total ($1.31 billion). The remainder ($1.27 billion) was financed with corporate funds some of which were borrowed from government lending agencies. Industry financing was aided substantially by certificates of necessity entitling the holders to increased income and excess-profits-tax deductions and renegotiation allowances, which make possible accelerated amortization of these facilities over a period of five years or less.

This investment resulted in an overall increase in steel ingot capacity from approximately 82,000,000 net tons in 1938 (the latest available comprehensive peacetime compilation of capacity in the iron and steel industry) to approximately 96,000,000 net tons, or 16.8 per cent.

Table III presents a break-down of

TABLE IV

Summary of steel expansion cost[1]

Industry	Industry-financed	Government-financed	Total
1. Integrated steel companies	$876, 694, 256	$792, 632, 305	$1, 669, 326, 561
2. Semi-integrated steel companies	58, 158, 742	84, 216, 176	142, 374, 918
3. Nonintegrated steel companies	29, 768, 143	8, 686, 575	38, 454, 718
4. Independent ore companies	29, 004, 034	3, 382, 000	32, 386, 034
5. Independent ore water transportation companies	24, 510, 012		24, 510, 012
6. Independent blast furnace companies	11, 544, 287	37, 045, 148	48, 589, 435
7. Independent steel warehouse companies	1, 239, 379		1, 239, 379
Total steel industry	1, 030, 918, 853	925, 962, 204	1, 956, 881, 057
8. Independent coal-coke companies	12, 011, 282	1, 405, 579	13, 416, 861
9. Refractory and flux companies	11, 961, 206	2, 395, 521	14, 356, 727
10. Independent ingot mould companies	2, 329, 034		2, 329, 034
11. Iron and steel scrap companies	880, 708	1, 336, 007	2, 216, 715
Total steel auxiliary industry	27, 182, 230	5, 137, 107	32, 319, 337
12. Independent steel casting companies	48, 329, 268	141, 077, 403	189, 406, 671
13. Independent gray iron casting companies	15, 218, 829	5, 737, 792	20, 956. 621
14. Independent malleable iron casting companies	12, 544, 173	13, 641, 264	26, 185, 437
Total foundry industry	76, 092, 270	160, 456, 459	236, 548, 729
15. Integrated forging companies	20, 199, 073	67, 165, 251	87, 364, 324
16. Nonintegrated forging companies	28, 692, 552	74, 594, 433	103, 286, 985
Total forging industry	48, 891, 625	141, 759, 684	190, 651, 309
17. Ferro-alloy companies	89, 822, 461	78, 215, 646	168, 038, 107
18. Miscellaneous companies	293, 927	211, 552	505, 479
Grand total	1, 273, 201, 366	1, 311, 742, 652	2, 584, 944, 018

[1] Source: Steel Expansion for War, a report prepared by the Steel Division of the War Production Board.

the overall increase in capacity by types of operating facilities:

The distribution of these expansions is graphically depicted in figures 6 to 8.

Figure 6 shows the distribution by principal steel-producing states in terms of net tons of the new steel ingot capacity financed by government and industry.

Figures 7 and 8 show the distribution of the wartime added capacity by producing areas and principal producing companies, respectively.

Figures 7 and 8 demonstrate that, except for western and electric furnace capacity, there have been no significant changes either in the relative importance of the principal steel producing areas or in the relative position of the principal producing companies.

The exceptions—the western and the electric furnace situations—are dealt with below at greater length.

Figures 9 and 10 demonstrate graphically the increased wartime volume of input of raw materials and output of finished steel products.

Table VI shows the annual consump-

TABLE V

Breakdown of additions to electric furnace capacity according to industry-owned and government-owned additions, 1938-45

[Millions of net tons]

Company	Changes in electric steel furnace capacity (thousands of net tons)—total capacity				Additions to capacity, 1938-45, by method of financing			
	1945	Percent of total	1938	Percent of total	Private	Percent of total addition	Government	Percent of total addition
Republic Steel Corp.	1,715	27.5	146	8.9	501	31.9	1,068	68.1
Copperweld Steel Corp.	484	7.7			180	37.2	304	62.8
Crucible Steel Co	472	7.6	131	8.2	273	80.1	68	19.9
United States Steel Corp.	429	6.9	885	5.3	179	52.0	165	48.0
Timken Roller Bearing Co.	346	5.5	252	15.6	94	100.0		
Northwestern S. & W. Co.	321	5.1	202	12.5	119	100.0		
Ford Motor Co.	198	3.2	42	2.6	156	100.0		
Andrews Steel Co.	195	3.1					195	100.0
Allegheny Ludlum	193	3.1	157	9.7	36	100.0		
Rotary Electric Steel Co.	170	2.7	101	6.3	69	100.0		
Bethlehem Steel Co.	158	2.5	27	1.7	131	100.0		
Youngstown Sheet & Tube Co.	120	1.9					120	100.0
Rustless Iron & Steel Co.	114	1.8	39	2.4	45	60.0	30	40.0
Midvale Co.	110	1.8	17	1.1	35	37.6	58	62.4
A. M. Byers	108	1.7			108	100.0		
Mesta Machine Co.	107	1.7	4	.2	103	100.0		
All others (32 in 1945, 24 in 1938)	1,008	16.2	411	25.5	330	55.3	267	44.7
Total	6,248	100.0	1,614	100.0	2,359	50.9	2,275	49.1

Source: Department of Commerce, Bureau of Foreign and Domestic Commerce.

TABLE VI

Annual consumption of finished steel by various industries

[In thousands of net tons]

Year	Total		Agriculture		Aircraft		Automotive		Construction		Containers		Furniture and furnishings		Machinery and tools		Oil, gas, water, mining		Pressing, forming, stamp		Railroads		Shipbuilding		Exports		All other	
	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent	Tons	Per-cent
1923	37,270	100.0	1,506	4.1	(1)	(1)	4,684	12.6	5,527	14.8	1,350	3.6	(2)	(2)	1,168	3.1	3,923	10.5	(2)	(2)	9,435	25.3	326	0.9	2,280	6.1	7,071	19.0
1924	31,457	100.0	988	3.1	(1)	(1)	3,339	10.6	5,376	17.1	1,355	4.3	(2)	(2)	1,127	3.6	2,880	9.2	(3)	(3)	8,059	25.6	259	.8	2,008	6.4	6,066	19.3
1925	37,394	100.0	1,264	3.4	(1)	(1)	5,472	14.6	6,203	16.6	1,598	4.3	(2)	(2)	1,514	4.0	3,192	8.5	(3)	(3)	8,746	23.4	341	.9	1,983	5.3	7,081	19.0
1926	39,756	100.0	2,020	5.1	(1)	(1)	6,144	15.4	7,027	17.7	1,509	3.8	(2)	(2)	1,273	3.2	3,973	10.0	(3)	(3)	8,574	21.5	344	.9	2,692	6.8	6,200	15.6
1927	36,825	100.0	1,987	5.4	(1)	(1)	5,482	14.9	7,781	21.1	1,577	4.3	(2)	(2)	1,170	3.2	3,256	8.8	(3)	(3)	6,980	19.0	445	1.2	2,382	6.5	5,765	15.6
1928	42,182	100.0	2,978	7.1	(1)	(1)	7,799	18.5	7,907	18.7	1,813	4.3	565	1.3	1,806	4.3	3,191	7.6	(3)	(3)	6,853	16.2	202	.5	2,757	6.5	6,311	15.0
1929	45,998	100.0	3,061	6.7	(1)	(1)	7,353	16.0	8,643	18.8	1,912	4.1	700	1.5	2,028	4.4	4,117	8.9	(3)	(3)	8,163	17.8	346	.8	2,495	5.4	7,180	15.6
1930	33,054	100.0	1,709	5.2	(1)	(1)	4,935	14.9	7,355	22.2	1,871	5.7	643	1.9	1,342	4.1	3,240	9.8	(3)	(3)	5,241	15.9	371	1.1	1,574	4.8	4,773	14.4
1931	21,477	100.0	1,349	6.3	(1)	(1)	3,527	16.4	4,589	21.4	1,585	7.4	412	1.9	791	3.7	1,722	8.0	(3)	(3)	3,035	14.1	224	1.0	940	4.4	3,303	15.4
1932	11,705	100.0	605	5.2	(1)	(1)	2,088	17.9	2,693	23.0	1,161	9.9	187	1.6	441	3.8	718	6.1	(3)	(3)	1,176	10.0	102	.9	436	3.7	2,098	17.9
1933	18,743	100.0	1,109	5.9	(1)	(1)	3,953	21.1	2,961	15.8	1,970	10.5	580	3.1	782	4.2	1,141	6.1	(3)	(3)	1,475	7.9	115	.6	747	4.0	3,910	20.8
1934	21,246	100.0	1,233	5.8	(1)	(1)	4,593	21.6	3,556	16.7	1,744	8.2	666	3.1	825	3.9	1,437	6.8	(3)	(3)	2,544	12.0	233	1.1	1,208	5.7	3,207	15.1
1935	26,840	100.0	1,976	7.4	(1)	(1)	6,738	25.1	4,315	16.1	2,284	8.5	1,266	4.7	1,091	4.1	1,608	6.0	(3)	(3)	1,961	7.3	207	.8	1,191	4.4	4,203	15.6
1936	37,858	100.0	2,238	5.9	(1)	(1)	7,517	19.8	6,468	17.1	2,750	7.3	1,583	4.2	1,680	4.4	2,684	7.1	(3)	(3)	4,082	10.8	288	.8	1,568	4.1	7,000	18.5
1937	41,178	100.0	2,335	5.7	(1)	(1)	7,814	18.9	6,038	14.7	3,219	7.8	1,494	3.6	1,804	4.4	3,034	7.4	(3)	(3)	4,686	11.4	391	.9	3,915	9.5	6,448	15.7
1938	23,569	100.0	1,110	4.7	(1)	(1)	4,053	17.2	4,398	18.7	2,137	9.1	868	3.7	831	3.5	1,820	7.7	(3)	(3)	1,444	6.1	390	1.7	2,422	10.2	4,096	17.4
1939	39,068	100.0	1,421	3.6	(1)	(1)	5,906	15.1	6,100	15.6	2,978	7.6	1,182	3.0	1,460	3.7	1,842	4.7	660	1.7	3,250	8.3	518	1.3	2,817	7.2	10,933	28.2
1940	48,660	100.0	1,630	3.3	51	0.2	7,965	16.4	6,936	14.3	3,068	6.3	(2)	(2)	2,330	4.8	1,900	3.9	2,296	4.7	4,019	8.3	1,000	2.1	8,720	17.9	8,745	17.8
1941	62,324	100.0	1,683	2.7	561	.9	9,847	15.8	10,221	16.4	4,612	7.4	(2)	(2)	3,366	5.4	2,929	4.7	3,677	5.9	5,983	9.6	2,929	4.7	6,045	9.7	10,470	16.8
1942	62,446	100.0	1,166	1.9	----	3,598	5.8	----	10,715	17.3	4,071	6.4	(2)	(2)	2,852	4.6	1,586	2.5	2,783	4.4	4,400	7.1	10,370	16.6	10,800	17.3	10,104	16.1
1943	64,152	100.0	1,462	2.3	----	3,460	5.4	----	6,640	10.3	4,301	6.7	(2)	(2)	3,275	5.1	1,903	3.0	2,839	4.4	5,172	8.1	13,318	20.7	8,850	13.8	12,932	20.2
POSTWAR ESTIMATES [4]																												
I	50,000	100.0	2,850	5.7	----	9,450	18.9	----	7,350	14.7	3,900	7.8	1,800	3.6	2,200	4.4	3,700	7.4	(3)	(3)	5,700	11.4	450	0.9	3,700	7.4	8,900	17.8
II	50,000	100.0	3,000	6.0	500	1.0	8,000	16.0	10,000	20.0	3,500	7.0	2,000	4.0	2,000	4.0	3,500	7.0	(3)	(3)	5,000	10.0	500	1.0	3,000	6.0	9,000	18.0
III	65,000	100.0	3,700	5.7	----	12,400	19.1	----	9,600	14.8	5,100	7.8	2,300	3.5	2,800	4.3	4,800	7.4	(3)	(3)	7,400	11.4	600	.9	4,800	7.4	11,500	17.7

[1] Negligible, or not available and included in "All other."
[2] Included in "Pressing, forming, stamping."
[3] Included partly under "Furniture and furnishings" and partly under "All other."
[4] Postwar estimates are from Post-War Prospects of the Iron and Steel Industry (unpublished manuscript by Marion Worthing). Estimates I and III apply to 1937 pattern of distribution to 50,000,000 and 65,000,000 tons of finished products, which would require an output of 70,000,000 to 90,000,000 tons of ingots. Estimate II is Miss Worthing's interpretation of the possible postwar pattern of distribution at total output of 50,000,000 tons.

Source: U. S. Steel, Temporary National Economic Committee Papers, vol. I, Economic and Related Studies, 1940, p. 327 ff., and The Iron Age, Jan. 6, 1944.

tion over the 20-year period from 1923 to 1943, of finished steel by various industries. Notable particularly are the shifts in demand from heavy steel products, such as rails, plates, and beams to light flat rolled products required by the makers of automobiles, refrigerators, and containers.

A special war-created situation exists with respect to alloy steel and electric furnace capacity. While the overall steel ingot capacity has increased since 1938 by 16.8 per cent, special war needs caused an almost 800 per cent increase in the output of alloy steel between 1938 and 1943, and a 287.5 per cent increase in electric furnace capacity. In 1938 alloy steel constituted about 5 per cent of the total steel output, while in 1943 it amounted to about 15 per cent.

The needs of the Armed Forces for the highest grade alloy steels called for a near tripling of electric furnace capacity. While alloy steels have been produced in open hearth furnaces —and more than two-thirds of alloy steels are so produced—many of the

TABLE VII

Western steel-making capacity,[1] 1938 *and* 1944, *in relation to* 1937 *steel shipments to* 11 *Western States*

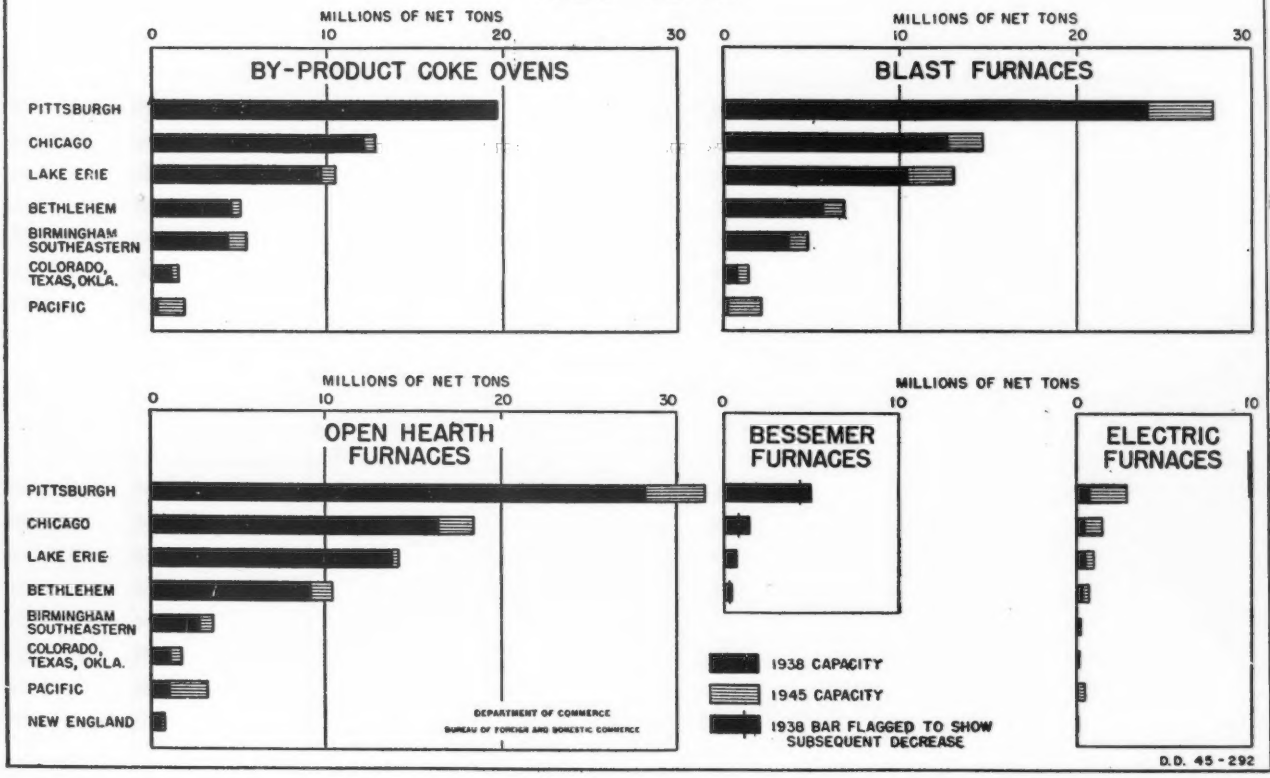
(Thousands of net tons)

Product	Western Capacity, 1938 [2]	Shipments Received in 11 Western States, 1937 [3]	Shipments by Western Producers in 11 Western States, 1937 [4]	Western Capacity, 1945
Pig iron	823.2	.....	.....	2,874.9
Ingot steel [6]	2,017.1	.....	.....	4,642.0
All steel products	[9] 1,526.8	2,847.4	.....	[5] 3,163.6
Selected finished products:				
Plates	25.2	215.3	28.8	1,025.2
Hot rolled sheets and strip	100.9	217.0	48.3	100.9
Cold rolled sheets and strip	.....	28.3	.....	.....
Tinplate	38.9	465.6	37.3	.....
Galvanized sheets	55.7	154.5	45.3	55.7
Rails (over 60 lb.)	336.0	265.6	186.6	336.0
Heavy shapes	99.3	164.1	49.1	389.3
Wire rods and bars	653.2	[7] 393.0	[7] 227.9	1,048.7
Pipes and tubes [8]	.....	431.9	.....	.....

[1] Includes Colorado Fuel & Iron Corp. in Colorado.
[2] Iron and Steel Works Directory of United States and Canada, 1938.
[3] National Resources Planning Board (from Temporary National Economic Committee data).
[4] Temporary National Economic Committee Form A reports from steel producers.
[5] Dr. J. R. Mahoney, Utah Economic and Business Review, June, 1944. Figures shown for western capacity to produce selected finished products are for 1944 rather than 1945.
[6] Includes steel for casting when made by steel-producing companies.
[7] Does not include wire and wire products.
[8] Includes lap weld, butt weld, and seamless only.
[9] Finished hot rolled products.

CHANGES IN STEEL PLANT CAPACITY BY DISTRICTS 1938–1945

FIG. 7



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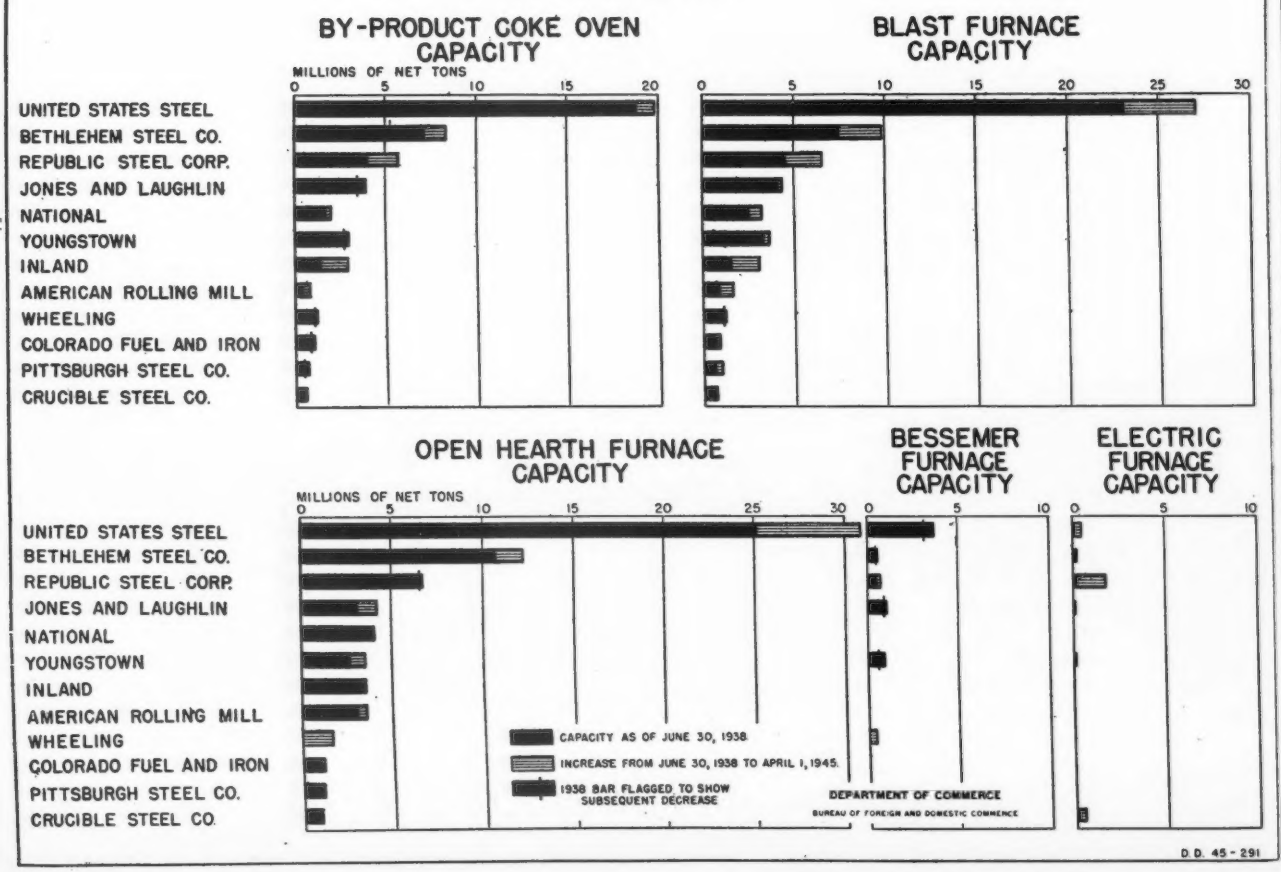
CHANGES IN STEEL PLANT CAPACITY 1938–1945

FIG. 8



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IRON AND STEEL INDUSTRY

FLOW FROM THE RAW MATERIALS TO THE FINISHED STEEL PRODUCTS

1937

(ALL FIGURES IN MILLIONS OF NET TONS)

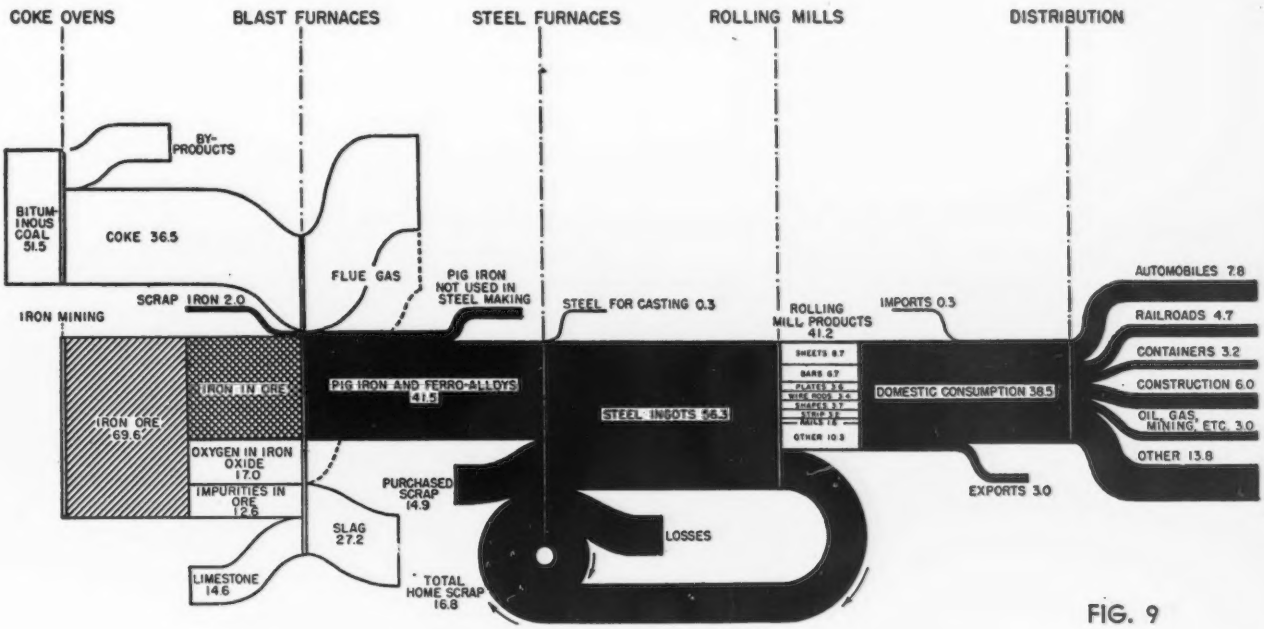


FIG. 9

IRON AND STEEL INDUSTRY

FLOW FROM THE RAW MATERIALS TO THE FINISHED STEEL PRODUCTS

1943

(ALL FIGURES IN MILLIONS OF NET TONS)

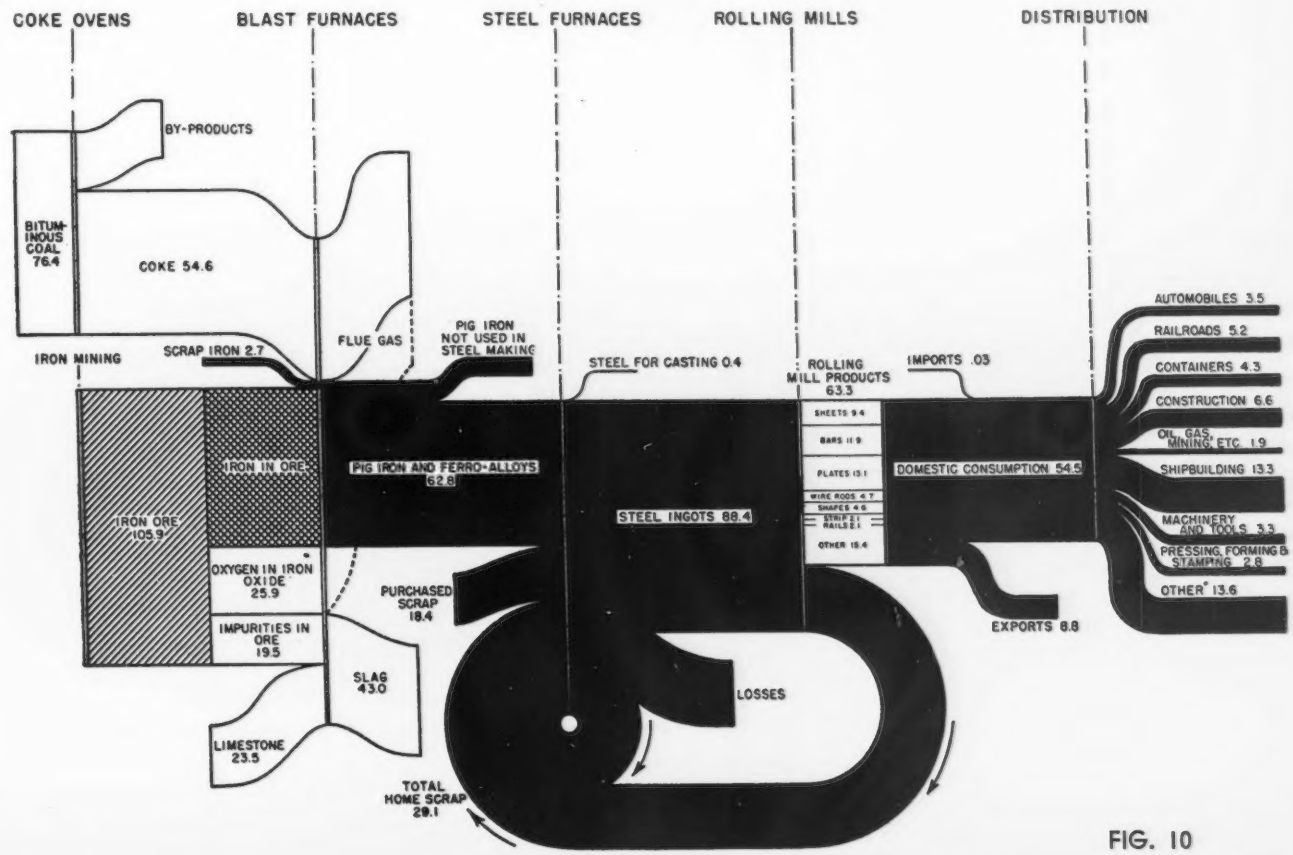
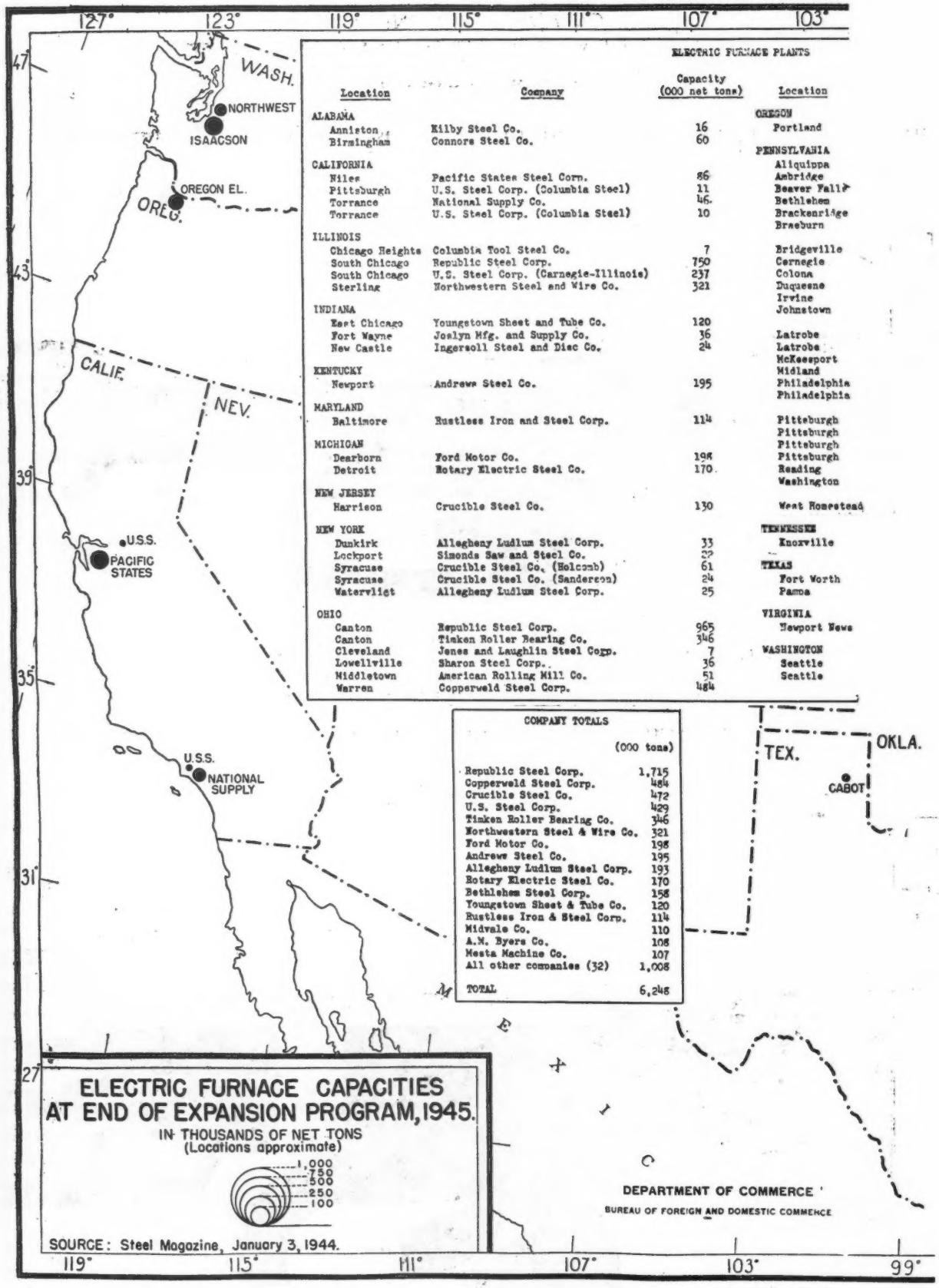


FIG. 10



ELECTRIC FURNACE PLANTS

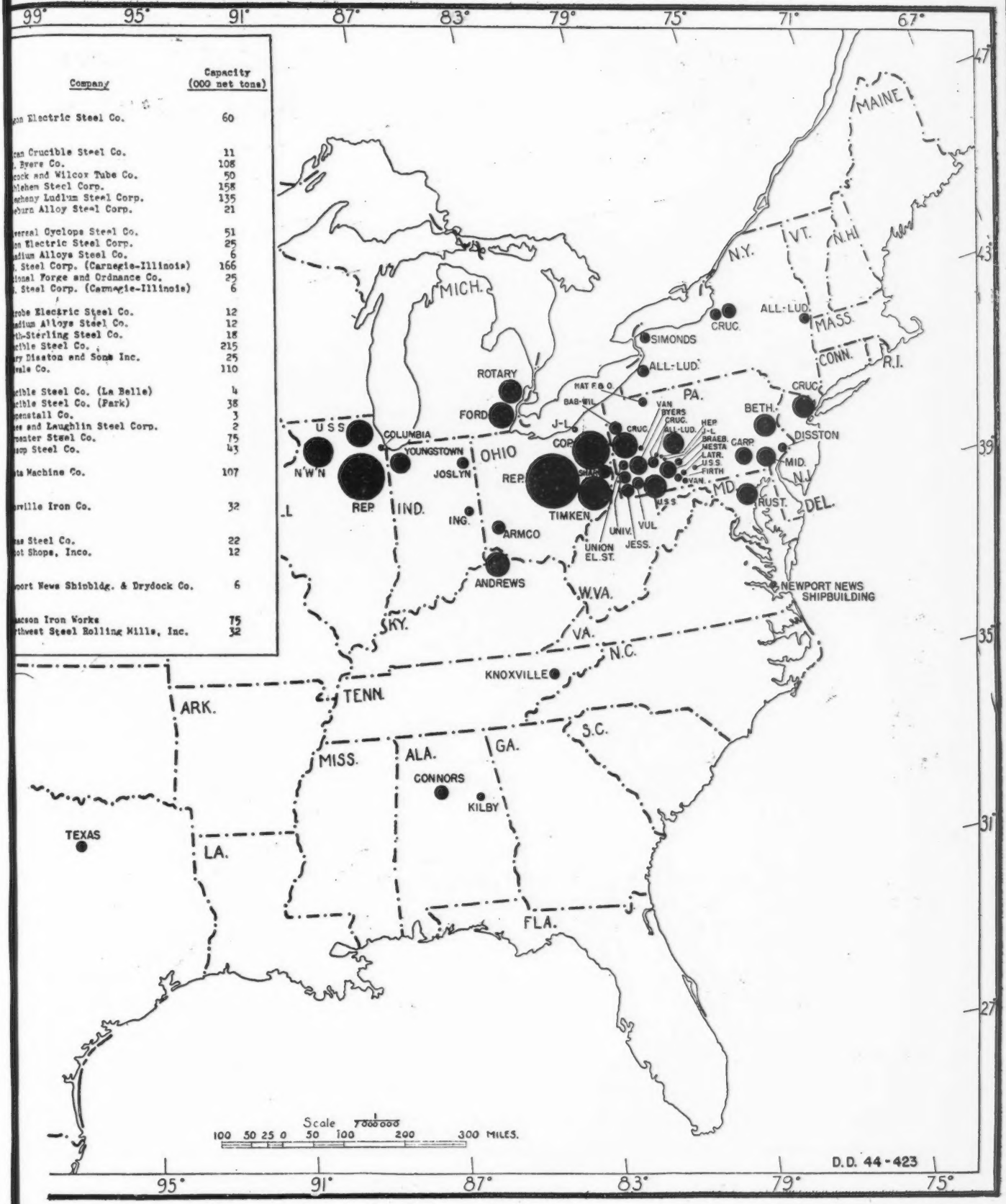
Location	Company	Capacity (000 net tons)
ALABAMA		
Anniston	Kilby Steel Co.	16
Birmingham	Connors Steel Co.	60
CALIFORNIA		
Niles	Pacific States Steel Corp.	86
Pittsburgh	U.S. Steel Corp. (Columbia Steel)	11
Torrance	National Supply Co.	46
Torrance	U.S. Steel Corp. (Columbia Steel)	10
ILLINOIS		
Chicago Heights	Columbia Tool Steel Co.	7
South Chicago	Republic Steel Corp.	750
South Chicago	U.S. Steel Corp. (Carnegie-Illinois)	237
Sterling	Northwestern Steel and Wire Co.	321
INDIANA		
East Chicago	Youngstown Sheet and Tube Co.	120
Fort Wayne	Joslyn Mfg. and Supply Co.	36
New Castle	Ingersoll Steel and Disc Co.	24
KENTUCKY		
Newport	Andrews Steel Co.	195
MARYLAND		
Baltimore	Rustless Iron and Steel Corp.	114
MICHIGAN		
Dearborn	Ford Motor Co.	198
Detroit	Rotary Electric Steel Co.	170
NEW JERSEY		
Harrison	Crucible Steel Co.	130
NEW YORK		
Dunkirk	Allegheny Ludlum Steel Corp.	33
Lockport	Simonds Saw and Steel Co.	22
Syracuse	Crucible Steel Co. (Holcomb)	61
Syracuse	Crucible Steel Co. (Sanderson)	24
Watervliet	Allegheny Ludlum Steel Corp.	25
OHIO		
Canton	Republic Steel Corp.	965
Canton	Timken Roller Bearing Co.	346
Cleveland	Jones and Laughlin Steel Corp.	7
Lowellville	Sharon Steel Corp.	36
Middletown	American Rolling Mill Co.	51
Warren	Copperweld Steel Corp.	484
OREGON		
Portland		
PENNSYLVANIA		
Aliquippa		
Ambridge		
Beaver Falls		
Bethlehem		
Brackenridge		
Braeburn		
Bridgeville		
Carnegie		
Colona		
Duquesne		
Irvine		
Johnstown		
Latrobe		
Latrobe		
McKeesport		
Midland		
Philadelphia		
Philadelphia		
Pittsburgh		
Pittsburgh		
Pittsburgh		
Pittsburgh		
Reading		
Washington		
West Homestead		
TENNESSEE		
Knoxville		
TEXAS		
Fort Worth		
Pampa		
VIRGINIA		
Newport News		
WASHINGTON		
Seattle		
Seattle		

COMPANY TOTALS

	(000 tons)
Republic Steel Corp.	1,715
Copperweld Steel Corp.	484
Crucible Steel Co.	472
U.S. Steel Corp.	429
Timken Roller Bearing Co.	346
Northwestern Steel & Wire Co.	321
Ford Motor Co.	198
Andrews Steel Co.	195
Allegheny Ludlum Steel Corp.	193
Rotary Electric Steel Co.	170
Bethlehem Steel Corp.	158
Youngstown Sheet & Tube Co.	120
Rustless Iron & Steel Corp.	114
Midvale Co.	110
A.M. Byers Co.	108
Mesta Machine Co.	107
All other companies (32)	1,008
TOTAL	6,248

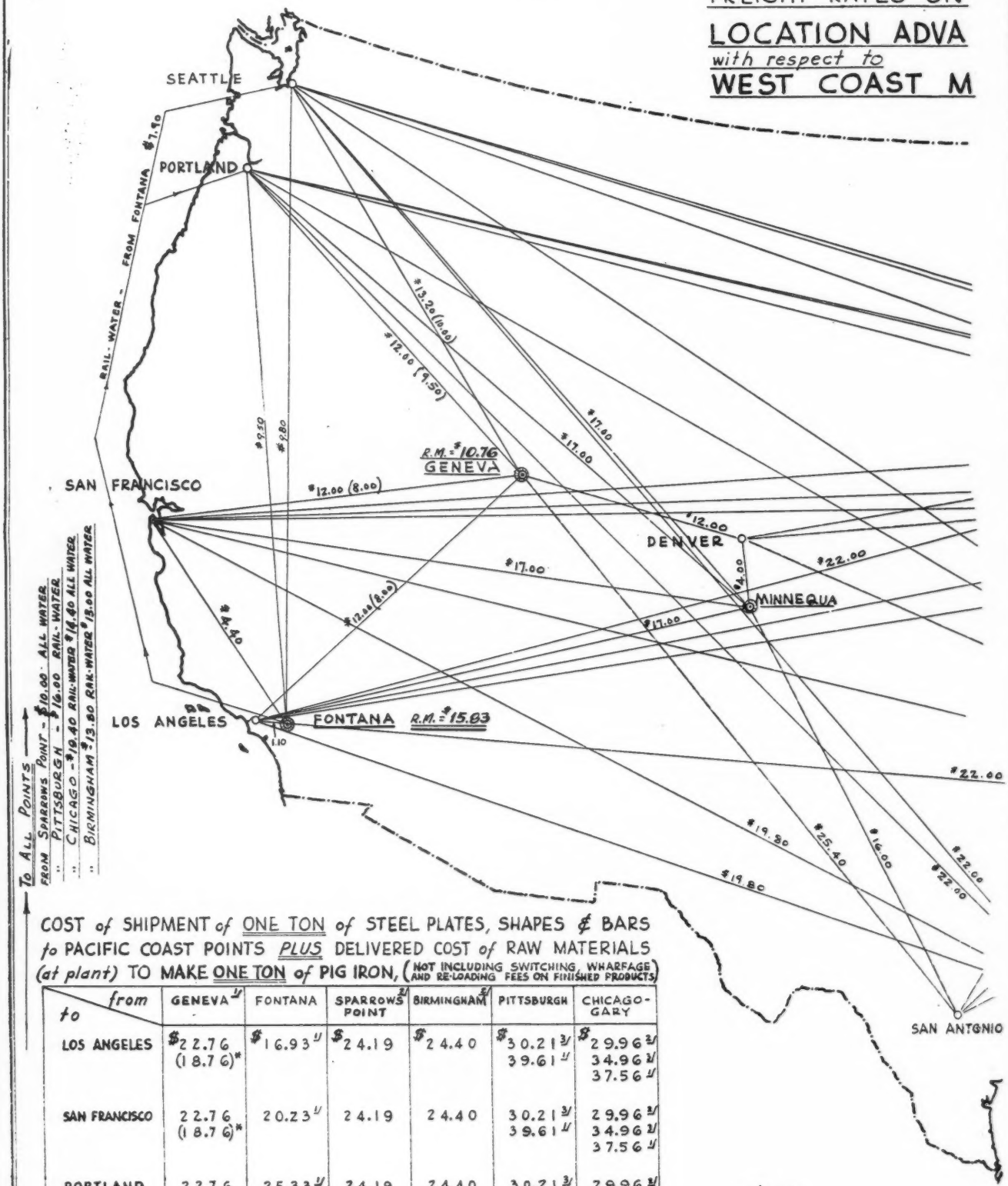
FIG.

Company	Capacity (000 net tons)
...on Electric Steel Co.	60
...can Crucible Steel Co.	11
... Byers Co.	108
...cock and Wilcox Tube Co.	50
...hlehem Steel Corp.	158
...chany Ludlum Steel Corp.	135
...burn Alloy Steel Corp.	21
...ersal Cyclops Steel Co.	51
...on Electric Steel Corp.	25
...adium Alloys Steel Co.	6
... Steel Corp. (Carnegie-Illinois)	166
...tional Forge and Ordnance Co.	25
... Steel Corp. (Carnegie-Illinois)	6
...robe Electric Steel Co.	12
...adium Alloys Steel Co.	12
...th-Sterling Steel Co.	18
...ctible Steel Co.	215
...ry Disston and Sons Inc.	25
...vale Co.	110
...ctible Steel Co. (La Belle)	4
...ctible Steel Co. (Park)	38
...penstall Co.	3
...es and Laughlin Steel Corp.	2
...venter Steel Co.	75
...sop Steel Co.	43
...ta Machine Co.	107
...erville Iron Co.	32
...as Steel Co.	22
...ot Shops, Inco.	12
...wport News Shipbldg. & Drydock Co.	6
...ckson Iron Works	75
...rthwest Steel Rolling Mills, Inc.	32



DEPARTMENT OF COMMERCE

FREIGHT RATES ON LOCATION ADVA with respect to WEST COAST M



COST of SHIPMENT of ONE TON of STEEL PLATES, SHAPES & BARS to PACIFIC COAST POINTS PLUS DELIVERED COST of RAW MATERIALS (at plant) TO MAKE ONE TON of PIG IRON, (NOT INCLUDING SWITCHING, WHARFAGE AND RE-LOADING FEES ON FINISHED PRODUCTS)

from / to	GENEVA 1/	FONTANA	SPARROWS POINT 2/	BIRMINGHAM 2/	PITTSBURGH	CHICAGO-GARY
LOS ANGELES	$22.76 (18.76)*	$16.93 1/	$24.19	$24.40	$30.21 3/ 39.61 1/	$29.96 3/ 34.96 3/ 37.56 1/
SAN FRANCISCO	22.76 (18.76)*	20.23 1/	24.19	24.40	30.21 3/ 39.61 1/	29.96 3/ 34.96 3/ 37.56 1/
PORTLAND	22.76 (20.26)*	25.33 1/ 23.73 3/	24.19	24.40	30.21 3/ 39.61 1/	29.96 3/ 34.96 3/ 37.56 1/
SEATTLE	23.96 (20.76)*	25.63 1/ 23.73 3/	24.19	24.40	30.21 3/ 39.61 1/	29.96 3/ 34.96 3/ 37.56 1/

Note

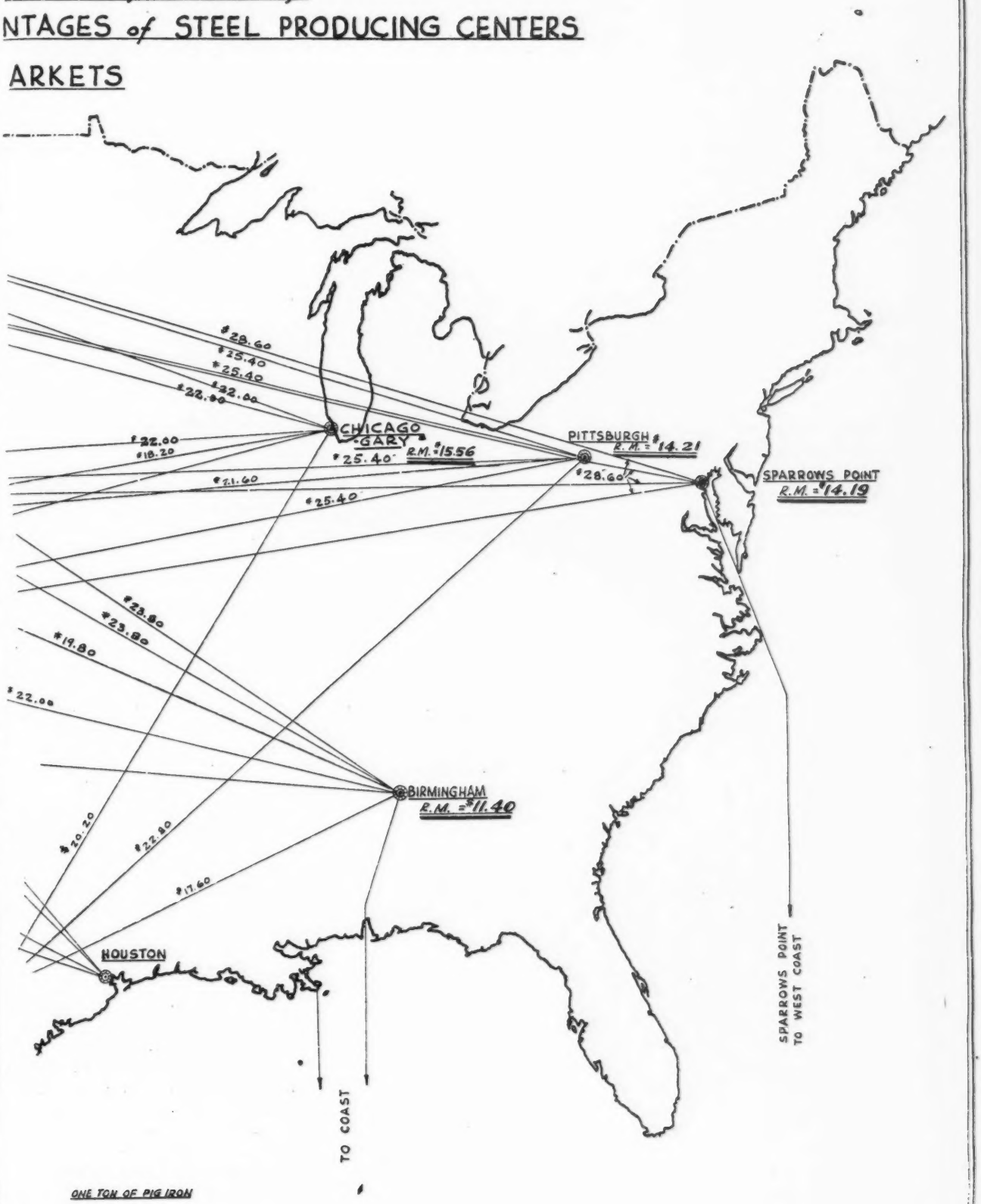
R.M. = COST OF RAW MATERIALS AT PLANT TO MAKE
* = SPECIAL GOVERNMENT RATE
1/ = ALL RAIL SHIPMENT
2/ = ALL WATER SHIPMENT
3/ = RAIL - WATER SHIPMENT

FIG.

PLATES & SHAPES &

NTAGES of STEEL PRODUCING CENTERS

ARKETS



higher priced grades, including stainless, are produced in electric furnaces where quality can be more closely controlled.

Figure 11 shows the location and relative capacity of electric furnaces in existence at the end of the expansion program in 1945. A breakdown of electric furnace capacity according to industry-owned and government-owned capacity is shown in Table V.

While the overall ingot capacity of the United States increased by 16.8 per cent, the capacity in the 11 Western States increased by 130 per cent. West of the Rocky Mountains the increase was almost twice as great. Most of this increase is accounted for by two new integrated steel plants which were built during the war—the government-owned plant at Geneva, Utah, and the government-financed plant at Fontana, Calif., owned by the Kaiser Co. The government investment in these two plants alone approximates $300,000,000.

Most of the new wartime capacity in the West was built for the production of plates for the West Coast shipbuilding program.

A summary of the western steel capacity and consumption, is shown in Table VII.

The following significant facts are indicated by this table:

(*a*) Western productive capacity in the prewar period (1937) was considerably below western consumption. Although in rails, bars, and other merchant mill products western capacity was in line with the requirements of the area, in flat rolled and tubular products western consumers were dependent upon eastern sources of supply.

(*b*) Wartime increases in capacity have been so concentrated in plates, which increased from 25,000 net tons in 1938 to 1,025,000 net tons in 1944, and to a lesser extent in bars and shapes, that continued operation of the new western integrated plants will require substantial shifts in the products produced.

(*c*) On the basis of the steel consumption in the 11 Western States in 1937, the most obvious market prospects for utilizing the new steel-producing capacity would appear to be in tubular and light, flat-rolled products, especially tinplate.

Table VIII shows the regional consumption of steel within the western area. The concentration of markets in the coastal regions in the 5-yr. period preceding the war is apparent. California alone accounted for more than 70 per cent of western steel consumption.

TABLE VIII

Prewar normal annual western steel consumption distributed by consuming area
(1936-40 average)

Consuming area:	Net tons
Southern California	865,000
Northern California	680,000
Arizona	34,000
Nevada	6,000
Oregon	114,000
Washington	219,000
Idaho	18,000
Utah	58,000
New Mexico	65,000
Montana	35,000
Wyoming	23,000
Colorado	81,000
Total distributed by States	2,198,000

Source: The Western Steel Market, Los Angeles Chamber of Commerce.

Table IX indicates the source of steel consumed in the West during the 5-yr. period from 1936 through 1940.

Since major western markets are at or near Pacific ports, a large part of the steel consumed there is shipped by water from eastern producing areas. The relative importance of in-bound water shipments of steel is a major factor in assessing the prospects in coastal markets of the postwar western steel industry.

Figure 12 is designed to point out the relative location advantages of the various steel-producing centers with respect to the western market.

The "R. M." figures shown on the map indicate the cost of the assembled raw materials required for the manufacture of one ton of pig iron at each of the principal producing centers.

The lines from producing points to Pacific ports indicate steel freight rates in effect from those producing points to such ports.

The exhibit further shows the all-water and rail-water rates from certain producing points to these ports.

The table in the lower left hand corner combines assembled raw materials cost and rates from each principal producing point to western destinations to give an indication of the relative cost positions. The great importance of commercial transportation rates—both water and rail—on steel products within and into the West are apparent from this table.

TABLE IX

Consumption of steel products in the Far West (7 Far Western States)
(Net tons)

	1936	1937	1938	1939	1940	5-Year Average
Intercoastal receipts	849,109	1,094,238	630,035	909,014	1,082,010	912,887
Net receipts by rail:						
Revenue freight	567,293	626,433	388,050	557,231	670,539	561,909
Nonrevenue freight	146,437	139,836	111,985	114,533	156,159	133,790
Foreign imports	70,611	72,366	49,051	41,674	1,965	47,133
Local production:						
California	525,258	480,353	399,230	517,109	623,366	509,063
Washington	105,052	96,071	79,846	103,422	124,673	101,813
Less foreign exports	30,480	64,844	19,733	22,233	107,398	48,938
Less shipments to Alaska	13,099	14,983	14,206	13,699	20,621	15,322
Total	2,220,181	2,429,470	1,624,288	2,207,051	2,530,693	2,202,335

Intercoastal receipts: United States Maritime Commission "United States Intercoastal Traffic by Ports of Origin and Destination and Principal Commodities." Report shows total intercoastal receipts of iron and steel. The published figures have been reduced by 20 per cent to exclude receipts of products such as castings, cast iron pipe, hardware, scrap, etc., which are not considered as steel mill products.

Net receipt by rail, revenue freight: Derived from the commodity statistics included in the annual reports of class I and the principal class II railroads to the various state railroad commissions in the seven Pacific Coast states. The statistics represent the excess of tonnage terminated over tonnage originated in the several states in the following commodity groups:

511—Iron and steel pipe and fittings, n. o. s.

512—Iron and steel: Nails and wire, not woven.

513—Iron and steel rated fifth class in official classification, n. o. s. (also tin and terne plate).

Nonrevenue freight: The revenue freight figures do not include receipts of railroad materials which move into the district principally as railroad nonrevenue freight. The figures included as "nonrevenue freight" represent the tonnage of rails laid shown in the annual reports of class I and the principal class II railroads to the various state railroad commissions.

Foreign imports and exports: Foreign Commerce and Navigation of the United States, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce.

Local production: Annual statistical reports of the American Iron & Steel Institute. The figures for California include a negligible amount of production in the mill of the Mechanical Division of the Panama Canal. Production in Washington and Colorado were combined in the institute's reports. The latter was excluded on the basis of the figures on shipments of finished products by the Colorado Fuel & Iron Corp. reported in Moody's. The remainder, production in Washington, averaged 20 per cent of the California production over a period of years. Washington production has therefore been computed at 20 per cent of California production.

Shipments to Alaska: Foreign Commerce and Navigation of the United States, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, December issues of monthly publications.

Virtually all shipments of steel mill products to Alaska are from Pacific Coast ports and the tonnage has been included in receipts or local production.

Source: The Western Steel Market, Los Angeles Chamber of Commerce.

Success of Sponge Iron Project Stalled Temporarily

Washington

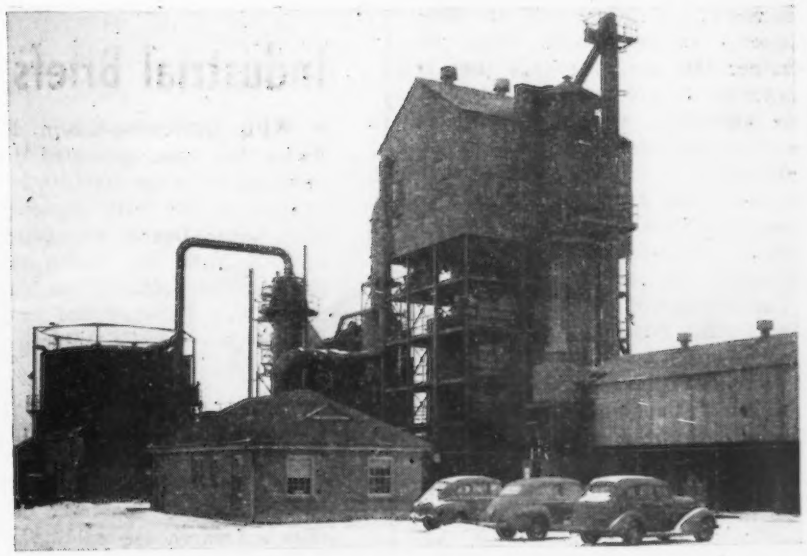
• • • **The most recent information** on the sponge iron situation, according to W. A. Hauck's WPB Steel Division report on steel expansion for war, is that in the experimental operation of the plant reduction was made at the rate of approximately 24 tons per day. However, during that time the material could not be briquetted due to the present inadequate briquetting press, and hence the reduced material had no additional value.

Acording to the report additional funds have been requested to install an adequate briquetting press and to make other changes which the designers of the plant and the operators think should be done to make a satisfactory plant.

The present estimated cost of the experimental ore reduction unit at the Warren, Ohio, plant of Republic Steel Corp. set at $1,132,000 is said to be considerably more than the original estimate. The latter is said to have been based upon a very incomplete design of a plant.

The operation of this sponge iron plant, the WPB hopes, will furnish answers to many of the present questions relative to the successful production of sponge iron. It is also hoped that some definite evidence as to the cost of such production and the commercial and competitive value of sponge iron to the steel industry will be realized.

According to the WPB the operation of the plant should indicate

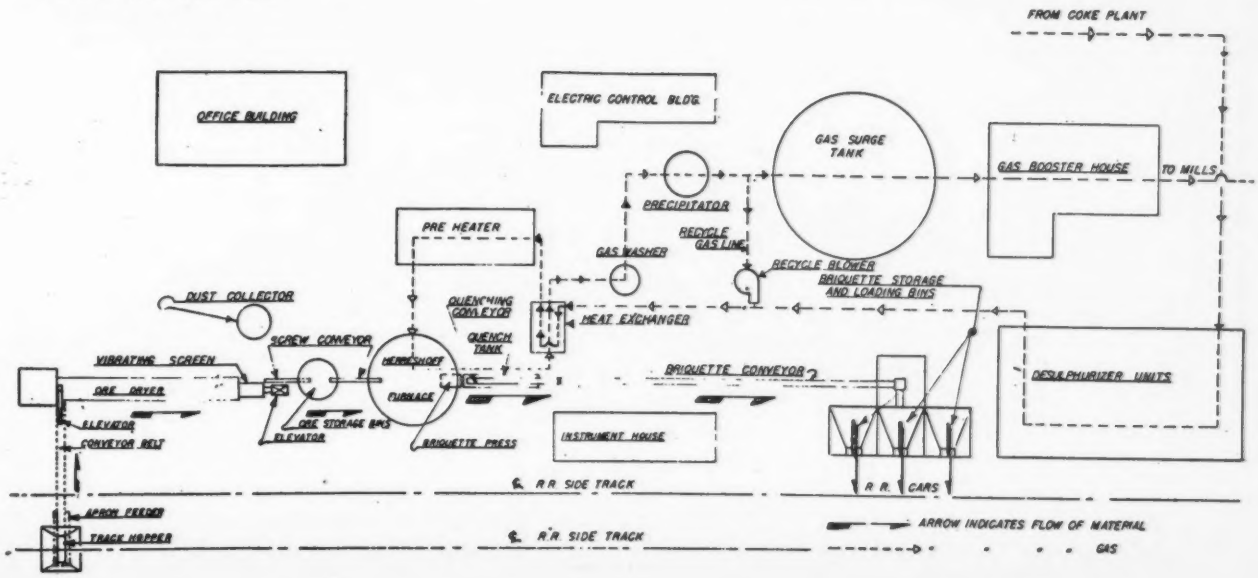


SPONGE IRON: *The sponge iron plant shown here is located at Warren, Ohio. It was constructed and is operated by Republic Steel Corp. Success with further experiments on sponge iron output is said to be awaiting the construction of an adequate briquetting press.*

FLOW OF ORE AND GAS

IRON ORE: Unloaded into track hopper (lower left-hand corner of chart); fed to rotary ore dryer; passed over vibrating screen; delivered to ore storage bins; fed into top of Herreshoff furnace; moved continuously through furnace dropping from one hearth to the next lower; discharged from bottom hearth to briquette press and compressed into briquettes; briquettes quenched in water and conveyed to briquette bins for shipment.

COKE OVEN GAS: Supplied by line from coke plant (upper right-hand corner of chart); passed through desulphurizer; passed through heat exchanger; passed through pre-heater; passed into Herreshoff furnace in one to three ways in which all of the gas is discharged as jets impinging directly upon the bed of the ore; rises upward through the furnace; leaves through top of furnace; passes through heat exchanger; passes through gas washer; passes through precipitator; passes to surge tank and returned to main gas line; flows to gas stabilization station and then to steel mills.



whether or not sponge iron can satisfactorily compete with scrap or whether the use of sponge iron is limited to the production of only certain high-grade steels for which it may have qualities superior to that of ordinary scrap. It is also hoped that the experiment can establish the possible feasibility of making sponge iron at isolated iron ore properties throughout the country.

The shortage of suitable steel scrap for electric furnace output in the summer of 1942 was the impetus for the production of sponge iron, which is a form of metallic iron resulting from a direct reduction of iron ore at temperatures below those required for smelting. It is quite porous and open in structure and its use in the steel industry is dependent upon the extent to which it can be successfully and commercially produced.

According to the WPB, it is difficult at this time to estimate accurately the cost per ton of the sponge iron briquettes. It was said this cost will depend upon many factors that cannot be determined until the normal plant operation has been obtained. Approximately 2000 tons of iron ore concentrates have been charged for experimental reduction. This resulted in a product ranging from totally unreduced material to highly reduced material of which approximately 400 tons averaged 75 per cent or more metallic iron.

Because of improper briquetting practically all of the material made, except for a small tonnage used in an electric furnace heat, was put over sintering machines and prepared for charging in blast furnaces. This material had no additional value so far as the reduction was concerned.

RFC Seeking Abandoned Plane Plant for Warehouse

Buffalo

• • • **The Reconstruction Finance** Corp. is reported to be seeking a long lease on the Elmwood Ave. plant now occupied by the Bell Aircraft Corp. for use as a surplus property warehouse. Bell is transferring its Buffalo operations to the Niagara Falls plant and the Elmwood Ave. property will revert to the owner, American Radiator.

Should the negotiations be successful, it is expected that the RFC will drop previously announced plans to build a warehouse on property of the New York Central Railroad at Depew.

Industrial Briefs . . .

• WPB DIRECTOR—Edwin E. Vallon has been appointed director of the wage stabilization division of the Sixth Regional War Labor Board, succeeding E. B. McNatt. Mr. Vallon has been assistant chief of the National War Labor Board case analysis branch in Washington, D. C., since January 1944.

• WAREHOUSE BUILDING — Approval has been given by WPB for A. M. Castle & Co., steel distributors, to construct an office and warehouse building at Seattle. The firm has operated a warehouse there for the past 30 years, located at 32 West Connecticut Street until March 1942, when the property was taken over by the Port of Embarkation. The new project will include a brick office building and covered steel frame bays serviced with electric traveling cranes.

• APPOINTS DIRECTOR—The Welding Research Council of the Engineering Foundation has announced the appointment of W. Spraragen, present executive secretary of the council, to the newly-created position of director. The Welding Research Council is a cooperative scientific research organization which is engaged actively in the study of matters related to the science and art of welding.

• SHIPS WELDING—Announcement of a lightweight, portable welding system for shipboard use, employment of which permits rapid repair of battle damage while vessels are still at sea, has been made by General Electric, its developer and producer. This work, done in collaboration with the Navy Department, Bureau of Ships, employs a unique design never before attempted on sea-going welders, and offers a considerable weight reduction, great flexibility and mobility, being able to operate from a ship's ordinary power outlet, the same as any other plug-in equipment.

• AVIATION DIVISION — Goodyear Tire & Rubber Co., Akron, Ohio, has established an Aviation Products Division to consolidate all aircraft production activities of the company. R. W. Richardson has been named manager. Tire, wheel and brake sales for airplanes, formerly a part of the Aviation Sales Division of Government Sales will become part of the newly formed division. So will aviation mounts, airfoam, molded parts and miscellaneous rubber items for aviation.

• PHILIPPINE ADVISER—It has been announced by Westinghouse Electric International Co. that Douglas C. Lynch, manager of the company's special projects department, has been granted a leave of absence to go to the Philippine Islands, where he will serve as technical adviser to President Sergio Osmena on problems connected with the restoration of electrical power plants and distribution systems.

• CHINESE STUDENTS—Twelve Chinese civil, electrical and mechanical engineers have started a year's training with the New York Central System, under arrangements made by the government of the United States and China. These men are all graduates of Chinese or American universities and are preparing themselves for the tremendous job of rehabilitating the Chinese railroads when the war ends. They are part of a group of 110 undergoing similar training on other railroads. Others will follow until 252 have been trained.

• INCREASED SHIPMENTS—Shipments by radio-electronic and machinery divisions of International Detrola Corp. totalled $21,554,354.00 in the seven months ended May 31, it was announced recently. The figures cover production in four plants, and show an increase of $147,000 over the comparable 1944 period.

The quality of every finished product depends upon equipment and care taken in every operation in production. Copperweld's Mill Heating Furnaces are automatically controlled and three zone firing systems assure uniform heating. Uniform heating is very important in producing top quality steels. The

Turning on the heat...for *Quality*

illustration above is Copperweld's 24" Mill Heating Furnace. The heating chamber is 60 feet long and 22 feet wide and has a 50 ton per hour capacity. It may be fired by either gas or oil.

Such equipment and care are typical of every operation in making ARISTOLOY Steels. That's why ARISTOLOY has earned the enviable reputation of "TOPS" in electric furnace steels.

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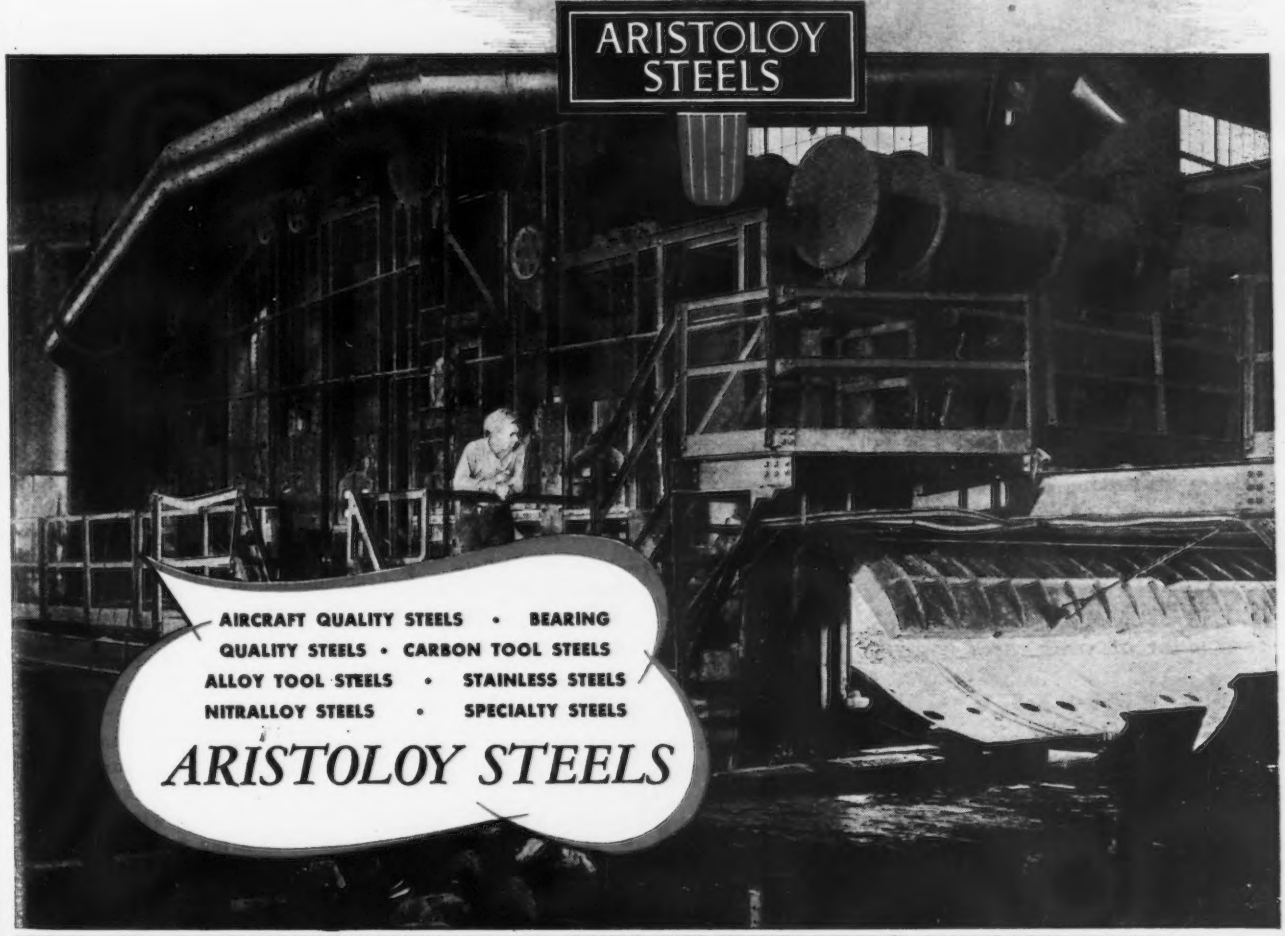
Branches in Principal Cities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Pre-VE-Day Optimism On Reconversions Plans Said to Have Vanished

New York

• • • **The optimism** of many pre-VE-Day estimates of the speed with which reconversion of war industry to peacetime production could be accomplished has been dampened by the realities of continuing war against Japan on an all-out basis, manpower and materials shortages, and inevitable delays in refitting plants and reorganizing their personnel, according to a detailed survey of industry prospects just made by the National Industrial Conference Board.

The survey shows that while limitations on 239 products will have been removed or modified by mid-July, "until cutbacks are effective in a substantial way at the rolling-mill and foundry level, manufacturers will be handicapped in raw materials for civilian products." It notes that cutbacks have been slow in steel-mill products "and since steel is the most universal raw material, reconversion may thus be delayed."

The survey finds that "while the physical problems of reconversion are difficult, even more difficult, or vital, are those of re-establishing the flow of goods through markets and reorganizing of personnel. As measured in numbers of men and dollars, the task is far beyond any similar undertaking the country has ever faced, though in proportion to population and industrial capacity, the problem may be no greater than after the Civil War."

Key comments from the board's survey of reconversion progress and prospects follow:

Demand: Record-breaking savings and income payments, together with vast deficiencies of consumer goods, are the foundation for strong, civilian goods demand in the period just ahead. Consumer spending in the first quarter of 1945 was 9 per cent higher than a year earlier.

Controls: Relaxation of controls is at present limited, most action coming from WPB, with little or none from the OPA, WMC and other agencies. Freedom to manufacture many things has been granted, but purchases of raw materials for these products must be confined to what producers care to offer after priority and Controlled Materials Plan orders have been filled.

Prices: Prices on goods will gen-

Michigan

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SIZES: 1/4" TO 4" O.D.
GAUGES: 9 TO 22

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Factories: Detroit, Michigan and Shelby, Ohio

DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.

erally be those which prevailed in 1942, with modifications only on permission of OPA. These changes are not usually easy to obtain nor always satisfactory.

Wages: In contrast with the lid on prices, there is much discussion about increases in hourly wage rates to offset the expected loss in overtime. Whether these relationships will affect production in the reconversion period remains to be determined.

Inventories: Declining inventories in the hands of manufacturers are an important gage of reconversion. They have been shrinking for more than a year and fell 0.7 per cent from February to March, but the liquidation was accounted for almost entirely by the nondurable goods industries.

Time and Tools: While production lines in the plumbing and heating equipment industries can be restored immediately, those of office equipment plants would require one to three months, mechanical refrigerator six to 12 months, various industrial equipment up to nine months, and the automotive industry from eight to 15 months. The prospect for new machine tools is brighter, and, if materials are available, the entire backlog of orders of this industry, amounting to $287,900,000, could be met in seven months.

Surplus Disposal: Government surplus equipment and materials are coming on the market rapidly. Although the specialized characteristics of these goods limit their utilization, they are facilitating reconversion, and their use is generally freer of restriction than new machines and materials.

Individual Industries

Steel: Shortages of manpower and coal, and the need for repairs have held steel production below full capacity. The tightness of steel supplies is a factor throughout the current business situation. Sheet production has been increasing, that of plate declining, as the shipbuilding schedule has been reduced. Cutbacks in steel are expected to increase through the summer, thus opening mill schedules to civilian orders. Alloy steel is not so tight as ordinary carbon grades, and recent airplane cutbacks are expected to open the alloy situation still further. As reconversion progresses, civilian demand is not expected to take up all the slack in steel from munitions cutbacks and terminations.

Nonferrous Metals: Practically all civilian uses of lead and tin are still

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The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

A new aluminum alloy, R-303, is claimed to be non-corrosive and to have twice the compressive strength of structural steel. *Reynolds Metals Co.*

get ready with CONE for tomorrow

A method has been announced for transmitting television programs over ordinary telephone lines, instead of coaxial cables or air relays, and for the recording of television in a manner comparable to the recording of radio. *Packard Mfg. Co.*

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The fuel being used in the B-29's over Japan is said to have an octane rating well over 130. *Aero Digest.*

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This year's models of one make of highway bus have rubber springs. *Twin Coach.*

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A newly installed turbine generator, in a city power station, has twice the capacity of the 14 previously installed units combined. *Fisk Station, Chicago.*

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One of our new aircraft engines weighs only 0.97 pounds per horse power. *Wright Cyclone 9.*

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The first American-built steam turbine locomotive is being given a service test. *Baldwin Locomotive Works, Penna. R. R.*

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Army aircraft are being "jacked up" when on soft ground by inflating large rubber pillows placed under the wings. *Science News Letter.*

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A manufacturer of aluminum utensils is planning to make aluminum kitchen furniture. *Aluminum Cooking Utensils Company.*

White or light colored vitreous enamels can now be applied directly to steel surfaces. *Inland Steel Company.*

get ready with CONE for tomorrow

A company has been established to process three-dimensional photographs (vectographs) in quantity for civilians. *Three Dimension Company.*

get ready with CONE for tomorrow

A new processed wood called "Staypak" has been developed that is claimed to be twice as tough as "Compreg". *U. S. Forest Products Lab., Madison, Wisconsin.*

get ready with CONE for tomorrow

In one city a system of radiotelephone communications between a central station and public or private vehicles is expected to be in operation by next fall. *Pittsburgh.*

An airport bus, designed to connect small towns with main airlines, has a ticket office, flight control tower, freight space, lunch counter, two-way radio, telephone and washroom, as well as seating space for passengers. *Parks Air Transport East St. Louis.*

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Reports say that one of our largest automobile manufacturers is planning an entirely new 5-cylinder car to sell at about 20% below the lowest prewar level. *Ford.*

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A new process so reduces the cost of making gasoline from natural gas that a large refinery is being planned for this purpose. *M. W. Kellog, Jersey City.*

get ready with CONE for tomorrow

30 to 50 ton trucks as long as 75 feet have been built and are now being put to specialized uses, such as the hauling of ore, aircraft and prefabricated houses. *Scientific American.*

SPEED
for
tomorrow's
competition
Sixteen tools on an 8-spindle Conomatic complete this part in 23 seconds — including the small hole on the end.
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AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.
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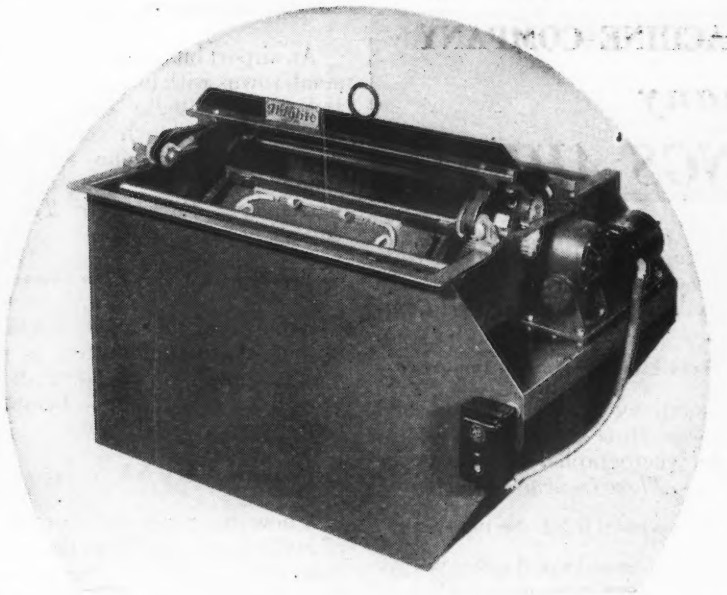
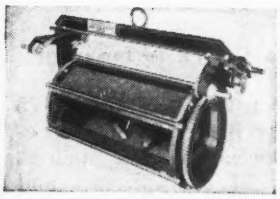
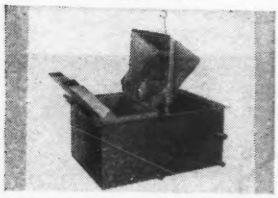
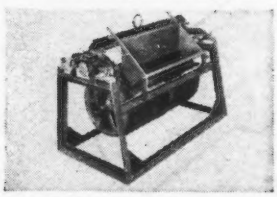




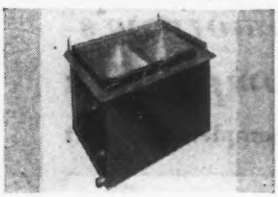
Plating cylinder.



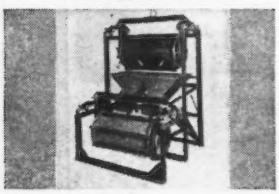
Double chute perforated rinse.



Loading stand with hopper.



Hopper type, rinse unit.



Transfer stand.

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● UDYLITE barrels are built to do a uniformly GOOD plating job year after year with a minimum of replacement and repair. Carrying loads of 150 to 200 lbs., service records of 18 to 24 months continuous use without breakdown or replacement are not unusual.

These barrels are available in a range of standard sizes, for alkaline or acid solutions. A complete line of well engineered supplementary equipment (as illustrated) make this barrel set-up most practical and efficient.

Operation in your own plant will show you that UDYLITE barrels last longer and produce consistently superior plating, with far less maintenance.

Complete specifications and details upon request.

Cylinder, cleaning unit.

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being strictly limited. Supplies of other nonferrous metals in ingot and pig form are plentiful, but there is a bottleneck at the rolling-mill stage, largely because of a shortage of manpower. Only in brass-mill products have cutbacks been large, and these are available for immediate shipment.

Automobiles: Output is expected to be light for many months to come. Besides the delays required for retooling, the industry must have large quantities of about two-score raw materials, many of which are still under restrictions or are scarce.

Power and Appliances: Industrial use of power is expected to fall off as war production declines. Pentup demand for household electric appliances may appreciably increase residential power consumption, but until cutbacks affect small motors the manufacture of household appliances may be slow. Backlogs for fractional horsepower motors is reported to amount to as much as one year's production. War contracts have given new life to many smaller shops, which may heighten competition in the industry.

Hard Goods: WPB controls have been lifted from a large number of consumers' durable goods, but shortages of raw materials may delay reconversion. According to industry members no mechanical refrigerators can be made available to the general public through normal retail channels until early in 1946, and similar delay is expected to affect such things as sewing machines, vacuum cleaners and radios. Washing machines will get priorities assistance. Only electric irons, among the principal household appliances, are expected to become available soon in any considerable quantity. Yet even in this case the year's production of about 2,000,000 irons is very far from meeting the estimated accumulated demand of over 5,000,000.

Building: Restrictions on home repairs and industrial construction of certain kinds have been eased and the third-quarter lumber allotment for civilian use will be about 13 per cent above the second quarter. Demand for residential construction is one of the most important of the present backlogs but, as in the case of automobiles, a vast quantity of a great variety of materials and finished products that are still in very short supply must be available before the building industry can become really active. There is also a shortage of some types of building craftsmen.

Railroads: Modernization of the

ONE OPERATOR USING AN ELECTRIC PROPELLED TRANSPORTER DOES WORK OF THREE MEN HANDLING MATERIALS THE OLD FASHIONED WAY..

Now there is

No Straining • No Pulling • No Tugging • No Pushing

Realizing the need for increased production, Frankel Brothers Limited, one of Canada's leading industrial companies in the smelting and refining of secondary metals, included battery-powered TRANSPORTERS for their handling requirements.

In this type of business, where accuracy, speed, and uniform production are necessary, streamlined, sturdily-built, cost-saving, and safe TRANSPORTERS, with their trouble-free operation have been a real assistance in helping to turn out more war essentials.

The TRANSPORTER in an exceptionally wide variety of applications, demonstrates its flexibility, its ability to work in small areas, its ease of handling, and its advantages in moving greater tonnages speedily with safety and with the elimination of unnecessary handling.

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We have a number of bulletins available, each featuring the TRANSPORTER at work in a different industry and pointing out the savings made.

ABOVE: *Metal being transported to its proper place in the store room.*

LEFT: *Heavy loads of metal are easily maneuvered with the Electric-Propelled* TRANSPORTER.

- **Positive Mechanical Brake with emergency Control**
- **Controls in Steering Handle**
- **Forward and Reverse Speeds**
- **Front Wheel Power Drive**
- **Shockless Hydraulic Platform Lift with Easy Foot Control**

MANUFACTURERS FOR OVER 38 YEARS *Electric Propelled* **INDUSTRIAL TRUCKS**

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AUTOMATIC TRANSPORTATION CO.
75 WEST 87th STREET CHICAGO 20, ILL.
Division of the Yale & Towne Manufacturing Company

designed to
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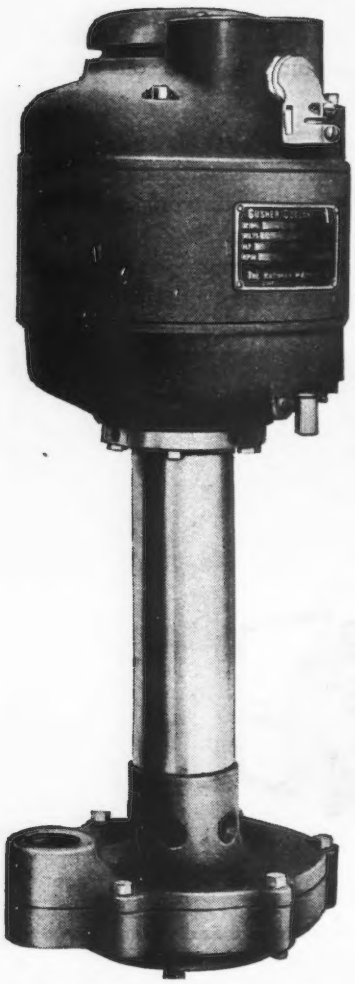
COOLANT PROBLEMS



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For steady trouble-free operation, specify Gusher Coolant Pumps on your machines. There is no need for priming . . . packing. The full ball-bearing design, rigid one-piece shaft, and sturdy overall construction of Gusher Coolant Pumps, assure you of longer life, less maintenance cost and uninterrupted, dependable service.

Gusher Coolant Pumps will supply any amount of coolant from a copious flow to a mere trickle. They can be throttled to any desired speed without building up pressure. It will pay you to investigate Ruthman Gusher Coolant Pumps before you make a decision.

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THE RUTHMAN MACHINERY CO.
1821 READING ROAD CINCINNATI 2, OHIO
THE "GUSHER"
A MODERN PUMP FOR MODERN MACHINE TOOLS

fixed plant of the railroads, that is, track and signals, was begun long before VE-Day, and is being carried on to virtual completion. Equipment, however, is being worn down by war requirements, and even partial replacement has been limited to freight rolling stock. The railroads have reduced fixed charges and are in a strong financial position to modernize passenger equipment and service but must wait for the necessary approvals, materials and manpower. Total carloadings are expected to remain at a high rate, despite shifts from northeastern to western carriers and changes in the kinds of freight loaded.

Begins Production of Irons

Chicago

• • • **Production of from** 8000 to 9000 electric ironing machines is scheduled in the next 60 days by Hurley Machine Co. This production was made possible by an inventory of materials and parts frozen at the start of the war, which were available when civilian electric ironing machine manufacture was authorized May 21.

The company is ready to produce between 10,000 and 12,000 electric washing machines when the barrier is lifted July 1. The first 50 ironing machines produced are being shipped to as many cities to be donated to the 7th War Loan Drive. The ironers will be the first turned out in the industry, according to Edward N. Hurley, head of the company.

Advisory Group Dissolved

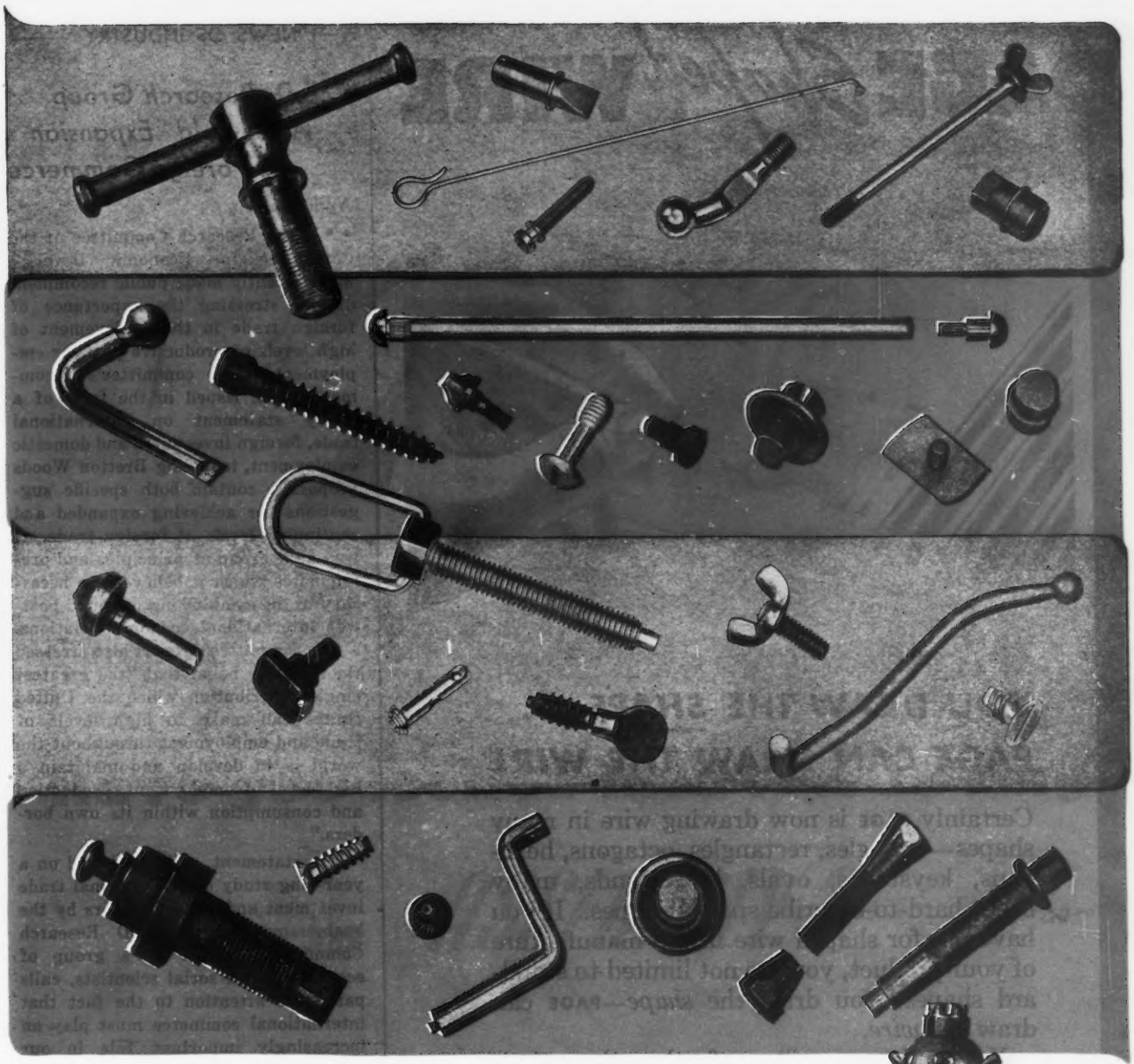
Washington

• • • **Three WPB Aluminum** and Magnesium Industry Advisory Committees were dissolved in May. The dissolved groups are the Air Cooled Radial Type Aluminum Cylinder Head Casting, Rolls Royce Merlin Aluminum Casting and Rolls Royce Contractors Aluminum Castings Committees.

Trade Act Extension to Senate

New York

• • • **The Senate Finance Committee** is said to have reported out to the floor of the Senate the bill for the three-year extension of the Reciprocal Trade Act agreement, together with a motion by Senator Taft to drop the President's authority to make a 50 per cent reduction from current rates of duty.



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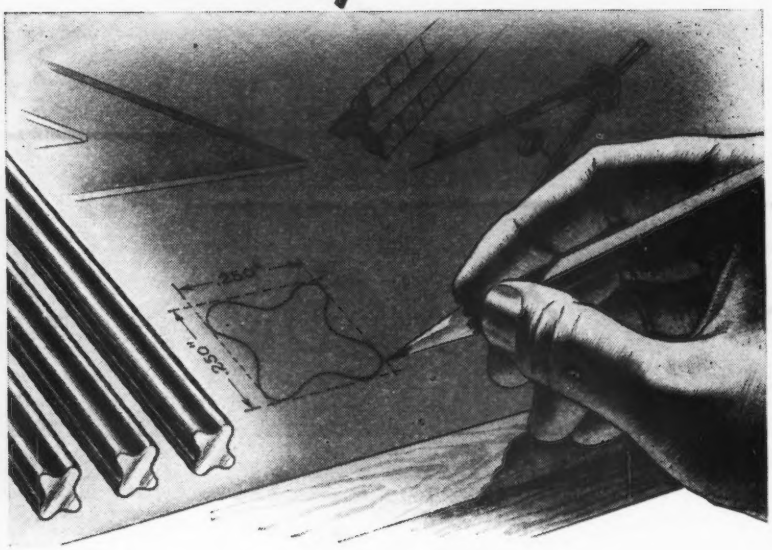

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C.E.D. Research Group Asks Bold Expansion Of Foreign Commerce

New York

• • • **The Research Committee** of the Committee for Economic Development recently made public recommendations stressing the importance of foreign trade in the achievement of high levels of productive postwar employment. The committee's recommendations, issued in the form of a policy statement on international trade, foreign investment and domestic employment, including Bretton Woods proposals, contain both specific suggestions for achieving expanded and continuing levels of foreign trade, as well as a group of principles and prerequisites which it believes are necessary to the establishing of sound postwar international economic relations.

The committee's report also stressed the corollary belief that "the greatest single contribution which the United States can make to high levels of trade and employment throughout the world is to develop and maintain a high level of employment, production and consumption within its own borders."

The statement, which is based on a year-long study of international trade investment and related factors by the businessmen of the CED Research Committee, advised by a group of economists and social scientists, calls particular attention to the fact that international commerce must play an increasingly important role in our postwar economic life. "International trade is a two-way street," states the committee, "and by freely exchanging the products which each country is best suited to produce we can achieve mutually higher standards of living."

The committee's specific recommendations for strengthening such reciprocal foreign trade after the war include:

First, an intensive effort by business, government, and labor to achieve quickly a high level of productive postwar employment *within* the United States.

Second, a prompt and final settlement of war debts and other international obligations which would be a source of uncertainty and which would restrict postwar trade. These measures should include: Repeal of the Johnson Act, prompt settlement of all net obligations arising out of wartime lend-lease operations; where can-

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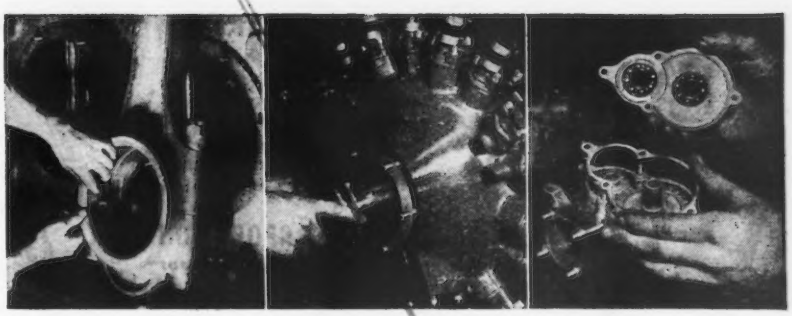

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2218

cellation of any of these lend-lease obligations is the most effective method of settlement, the committee recommends that they be cancelled, but with the understanding that the Master Agreements remain in force.

Third, a reduction or elimination of purely artificial barriers to world trade whether these be tariffs, import quotas, exchange controls of restrictive business agreements. Also similar removal of wartime controls over foreign trade at the earliest moment consistent with military necessity and the immediate economic after-effects of war. The committee recommends that the protective tariff of the United States be lowered through: Renewal and strengthening of the Reciprocal Trade Agreement Act by making the 50 per cent limit on reductions of tariffs apply to the rates existing in 1945; and that negotiations under the act be pressed vigorously so as to bring about substantial rate reductions.

As an added part of this program the committee recommends careful public scrutiny of cartel operations and elimination of restrictive monopolistic practices in international trade.

Fourth, in the field of finance the committee would place the international movement of capital, both public and private on an economic basis by: Avoiding the export of capital merely as a device for gaining temporary employment at home; utilizing the Export-Import Bank, with its lending power strengthened if necessary, for financing desirable transactions beyond the means of private funds; and contributing outright to those organizations which Congress may designate to help in relief and rehabilitation, but not to make gifts which are disguised as loans.

Insofar as possible, the movement of capital should, in the committee's opinion, be carried on by private enterprise with the government acting to facilitate such private movements.

Fifth, the committee urges American cooperation with other countries through membership in such official international organizations as are set-up to facilitate and expand world commerce, health, education, the arts, and other elements in a higher world standard of living.

In this regard, the committee has already made public its recommendations for strengthening the Bretton Woods Agreements and for their approval by the United States. In these earlier recommendations, the committee favored strengthening the Bank.

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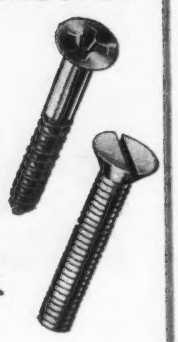

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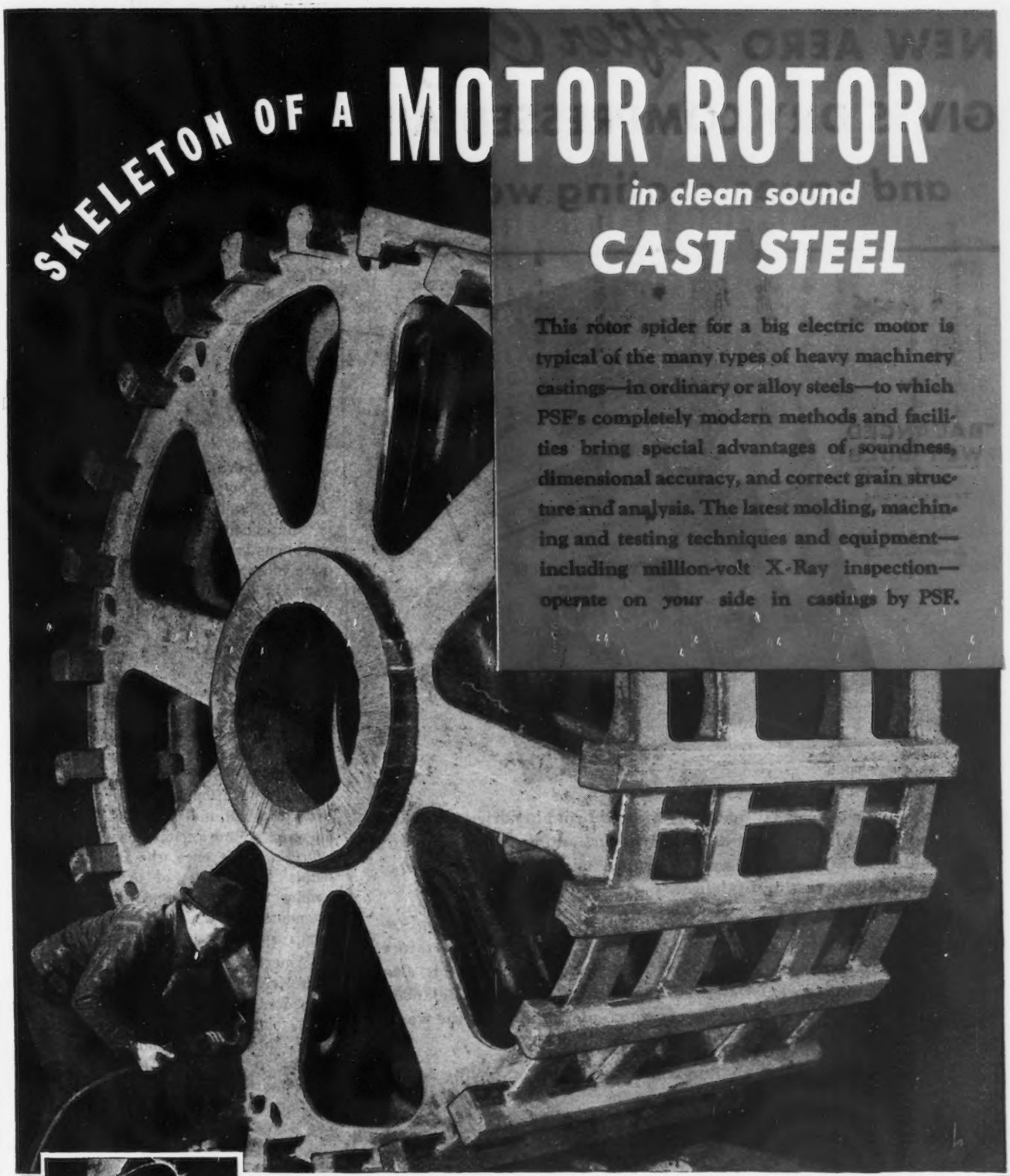

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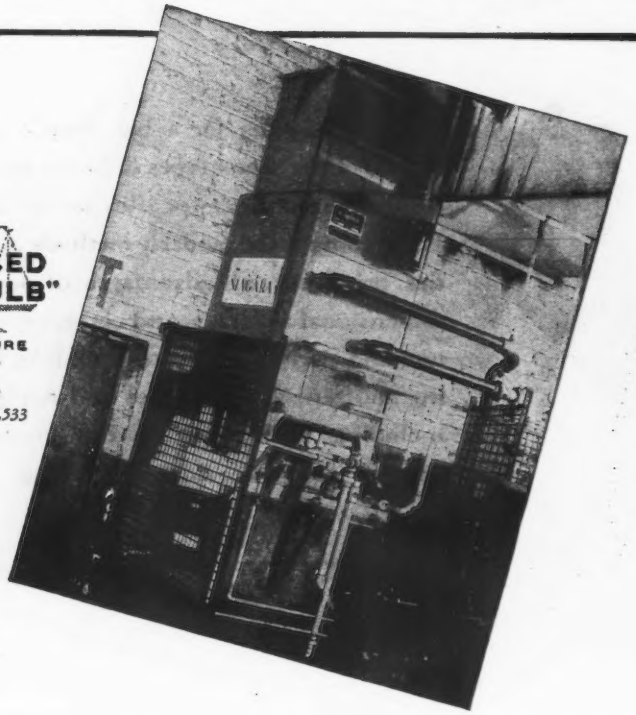

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Fire Protection Via Modern Building Codes Covered by A.I.S.I.

New York

• • • To help create better understanding of the fundamentals of fire protection regulation and to provide information on the nature and severity of fire hazards, American Iron & Steel Institute has published a 244-page book entitled "Fire Protection through Modern Building Codes."

The volume is the product of years of study of the many problems involved in the conception and application of building code regulations. It should prove helpful to code-writing officials and committees.

Its author, B. L. Wood, consulting engineer on the staff of American Iron & Steel Institute, has acquired a comprehensive knowledge of those problems through close cooperation with most of the organizations which formulate the nation's building construction and fire protection standards. In the course of writing this book, the author drew freely upon the experience which he has accumulated in helping to develop construction and fire protection standards in cooperation with such organizations as the American Standards Association, the American Society for Testing Materials, The National Bureau of Standards, the National Board of Fire Underwriters, the Pacific Coast Building Officials Conference, the Building Officials Conference of America, the Producers' Council and various government agencies.

The Committee on Building Codes of American Iron & Steel Institute, with Mr. Wood as its consultant, has sponsored various research investigations, surveys and tests to develop basic data and factual information relative to fire protection and structural matters essential for rational regulation of building construction. The suggested Building Classification and Fire Protection Regulations appearing in this book reflect the results of those investigations and tests.

Many regulations that appear in building codes were originally written many years ago. The limited knowledge and meager technical data then available were utilized to regulate the materials and constructions then in vogue. Many of those regulations have since been copied from code to code and have become entrenched by repetition. Developments in the building construction industry in recent years have caused some of those reg-

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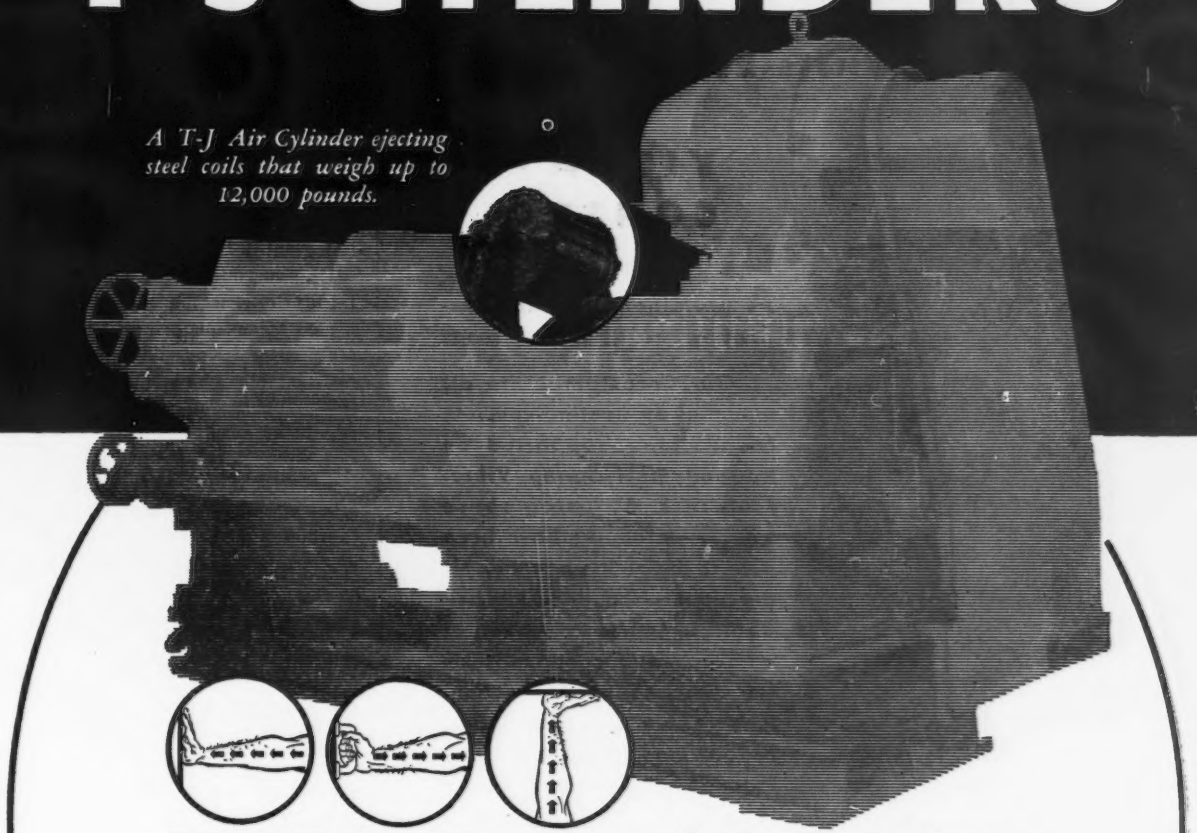

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ulations to become antiquated and obsolete. New requirements have acquired significance and meaning not contemplated when regulations which now tend to obstruct the adoption of sound and economical modern construction procedure, were written. As a consequence, millions of dollars annually have been added to the cost of building construction, and desirable improvements in the character of building construction have been retarded.

The need for modernization of building regulations is more urgent than ever. A recent publication of the Chamber of Commerce of the United States ("Building Codes") states "of special importance and urgency is the need to amend immediately those building codes which do not now permit the use of proven and tested technological developments."

One section of the book consists of regulations which were prepared as a part of the program of the Committee on Building Codes of the Institute to illustrate a practical application of the principles of fire protection. The regulations reflect careful study of the provisions and recommendations of the National Bureau of Standards and other regulatory bodies, and represent the committee's recommendations relative to fire protection regulation.

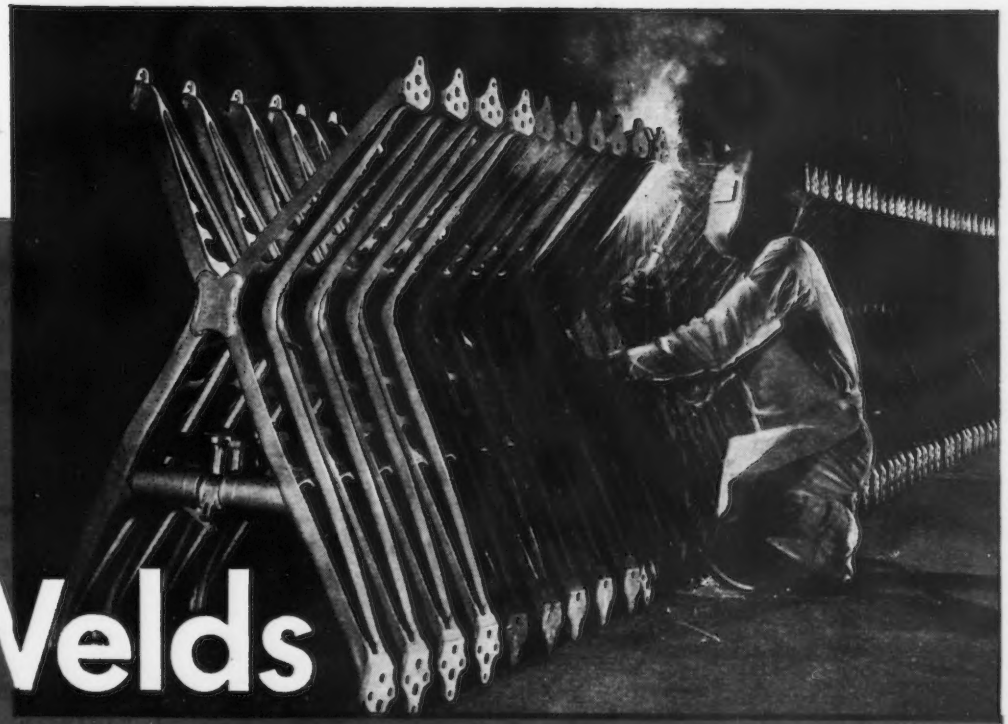
Cast Iron Soil Pipe Restrictions Remain

Washington

• • • Pointing out that the supply of cast iron soil pipe is far below the increasing requirements of the expanding construction program, members of the Plumbing and Heating Distributors' Industry Advisory Committee at a recent meeting recommended that L-79 be retained in order to maintain an even flow of plumbing, heating and cooking equipment. WPB accepted the recommendation.

Industry members said that before the war wholesalers and contractors maintained a stock of approximately 100,000 tons of soil pipe. Little stock, they declared, is now available and many construction jobs are delayed because of lack of soil pipe. Although the full capacity of the industry is about 700,000 tons, WPB officials said that 1944 production was only 165,000 tons.

Inability of bathtub manufacturers to meet the scheduled production of 50,000 bathtubs for the first quarter, Committee members said, was due to manpower shortages and war contract demands.



SMITHWAY Electrodes in action—Welding press-formed alloy steel truss members at 13 points assured adequate strength, boosted production and saved materials and finished weight on C-47 landing gear trusses, as compared with former forged steel construction.

13 Welds -BROKE A BOTTLENECK

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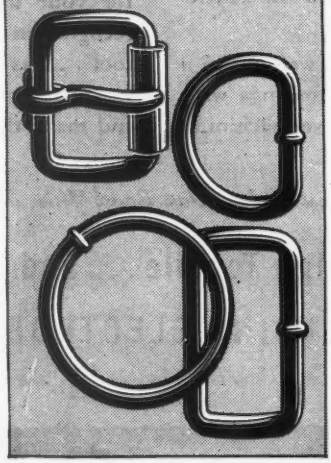

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Says Lower Freight Rates Will Increase Volume of Air Cargo

Chicago

• • • **Heavy air borne freight cargoes** are not likely until rates below 25c. per ton mile, including pickup and delivery, are achieved, Louis C. Sorrell, director of research, Air Transport Association of America, told the Chicago Aviation Forum conducted by the Chicago Association of Commerce and the University of Chicago here recently.

Marked reduction in rates coupled with merchandising efforts would bring larger volumes, studies made for domestic airlines indicate, he said. The studies do not as yet suggest any serious invasion into railroad less-than-carload and carload traffic nor into the traffic carried by truck and waterways.

The realization of prospects for a substantial increase in air cargo business will depend, in Mr. Sorrell's opinion, more upon the reduction of airline operating costs than upon any other factor in the situation.

"Missionary rates," he said, "may assist in starting the cargo trend upwards; contract carrying may develop more planeloads of cargo; but main reliance must be placed upon all those efforts at whittling away the costs of air transportation in every direction, reduction of cost of fuel, of terminal handling, of plane operation, of maintenance, of traffic and sales, which over the years will produce ton-mile costs far below those of today.

"The airlines have many problems to solve: The design of an effective system of rates and tariffs that will promote air cargo; solution of terminal organizational problems; the relations with other modes of transportation, upon which they must depend for completion of the cargo service. They must solve these problems rather quickly, while responding to public demands for a rapid expansion of their lines and services to other cities and communities. They will encounter strong competition from surface modes of transport who have great vitality, and who are by no means disposed to stand still while their lucrative traffic is drained away. The airlines cannot assume that their competitors are not alert to the situation, and are not able to counter with new combinations of rates and services.

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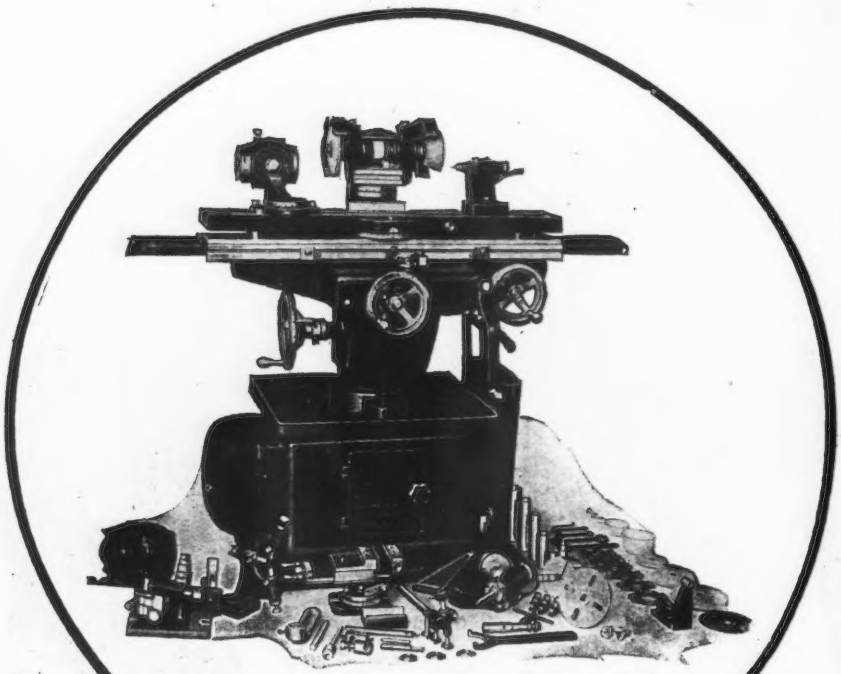

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Free Engineering Services Offered

Milwaukee

• • • **Manufacturers faced** with conversion problems can secure free engineering consultation services from the American Society of Industrial Engineers according to a plan outlined by Robert L. Crinnian, Detroit, president of the organization, who has been here conferring with local industrialists.

He pointed out thousands of smaller manufacturers throughout the country are planning to use machines now used in the making of war products in fields in which they have no experience. For this reason, he said, Boards of Commerce and Manufacturers' Associations stand in dire need of competent engineers and technicians to act as consultants in planning peacetime industrial needs in their respective areas.

"During the past four years manufacturers have not been able to keep abreast of the happenings in industry," Mr. Crinnian stated. "They have become so engrossed in their production of weapons and materials that they have not kept themselves informed of technological advances. New products, new developments, new ideas still continue to come into being which might well render a product of any existing organization obsolete overnight."

Mr. Crinnian warned that unless manufacturers planning for the production of new materials are kept advised of the changing situation there will be a great wastage of manpower, money and material at a time when the nation is facing the tremendous task of reconversion.

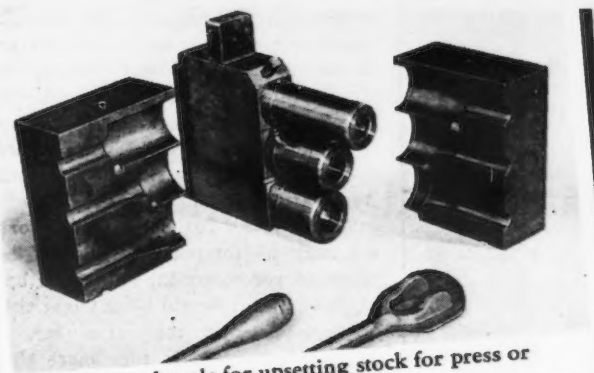
Women Are Gradually Leaving War Industry

Akron, Ohio

• • • **Women are** gradually leaving war industries and returning to the housekeeping fold, according to figures made public by the Akron Manpower Commission. In November 1943, a total of 23,635 women were employed in Akron rubber industries and at the close of May 1945, there were 17,775 employed. Aircraft factories employed a peak of 13,738 women and only 9645 are on company payrolls today.

Several reasons have been offered for the decrease, including cutbacks in fuel cell production and other smaller items along with the swing to

ADVANTAGES OF AJAX FORGING MACHINES in Conjunction with Hammers and Forging Presses



Dies and tools for upsetting stock for press or drop-forged jaw.

Upsetter dies for punching pin and tap size holes in drop-forged shackle.

Many forgings require the balling up of stock on the ends of bars to provide sufficient volume of metal to fill the impressions of the hammer or press dies. This operation can be done faster and more economically on Ajax Air Clutch Forging Machines than by drawing or fullering the shank from large stock.

On other forgings, the upsetter can be used to supplement the press or hammer for punching holes, trimming flash, ironing out draft or upsetting flanges which cannot be formed in the press or hammer dies.

Write for Bulletin No. 65-B

THE AJAX MANUFACTURING COMPANY
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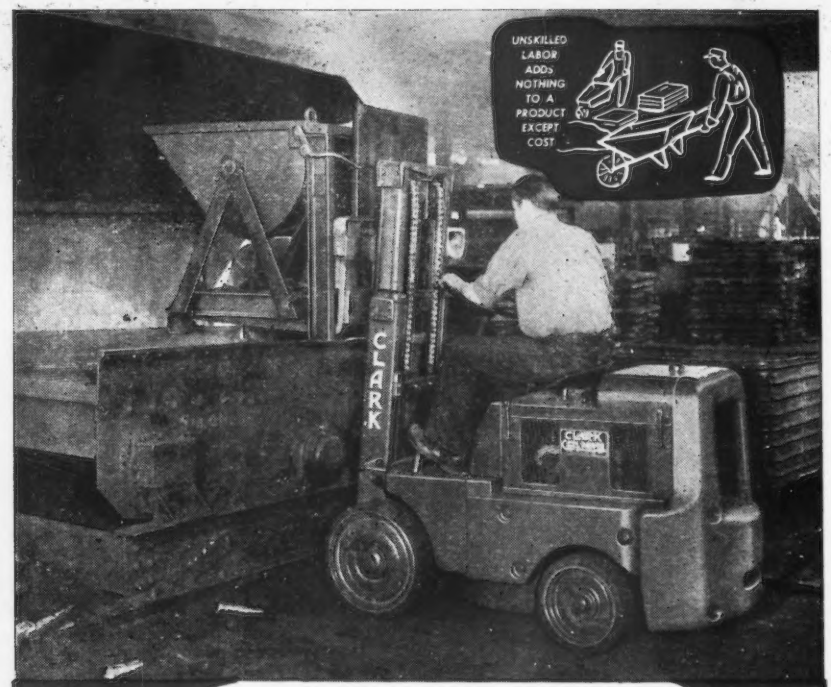

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greater production of truck tires for the armed forces, which has demanded men, despite the fact that many women learned to make tires and can build an ordinary automobile tire.

Summit County figures show that a peak number of 40,367 women were employed in the 25 most important war industries, while 30,245 is the top figure today.

According to employment officials, many women in the shops are merely waiting for their husbands to return from service so they may return to their homes and leave their jobs for newly discharged veterans. This is indicated by the number of women who have signified that they want a 30-day leave of absence if their husbands get a leave between service in Europe and re-assignment to the Central Pacific.

NAM Expects Short Reconversion Cycle For Ohio Industry

Cleveland

• • • **Fifty-six per cent** of Ohio factories will not require any time for reconversion when war contracts are cancelled, and industry throughout the state will be able to employ 36 per cent more workers after the war than they did before the war, according to the report of the National Association of Manufacturers.

As many as 261,000 factory workers may be temporarily laid off because of reconversion, but about half of this number would be out less than four weeks and the remainder, or about 125,000, would face more than four weeks of unemployment. By the end of 12 weeks, all but 7,000 of these would be back on the job, in one shop or another.

Ohio's projected gain in employment is reflected by replies to questionnaires sent to 172 manufacturers who employ about 10 per cent of the industrial workers in the state, and this survey indicated that there will be about 265,000 more factory jobs in Ohio after the Japs are licked than there were at the time war broke out in Europe.

In 1939, there were approximately 740,000 workers in factories in this state, but after the postwar reconversion period, there should be a rise to 1,005,000. Some manufacturers will not be able to surpass their prewar levels, but a large majority will. According to the NAM survey, only five per cent of Ohio's factories will have fewer jobs than in 1939, and

(ADVERTISEMENT)

How Stainless Steel is Machined at Roebling's

Correct Control Brings Results in Quantity Production of Aircraft Cable Fittings—Tolerances of .0005" Maintained—Importance of Power, Speed, Feed, Tool Angles, Coolants

A Report on the Details of Operations in the Trenton, N. J. plant of John A. Roebling's Sons Company

The machining of stainless steel is not difficult, but different, as compared to ordinary screw stock. The main difference is that you cannot be careless with stainless. Everything along the stainless production line must be kept under exact control. This sums up the experiences of Ray Brodowski, Foreman of Dept. 26, John A. Roebling's Sons Company, Trenton, New Jersey.

The job must be done with unusual accuracy. All the strength that can be had must be crowded into very thin cross sections with widely differing dimensions. This calls for fine machining with a capital "F"; the job would be tough to handle no matter what the material.

The finished parts must be swaged onto steel cables. This requires the selenium grade of Rustless 18-8 FM, Type 303, since the grades containing other free machining agents have been found unsuited for this severe operation.

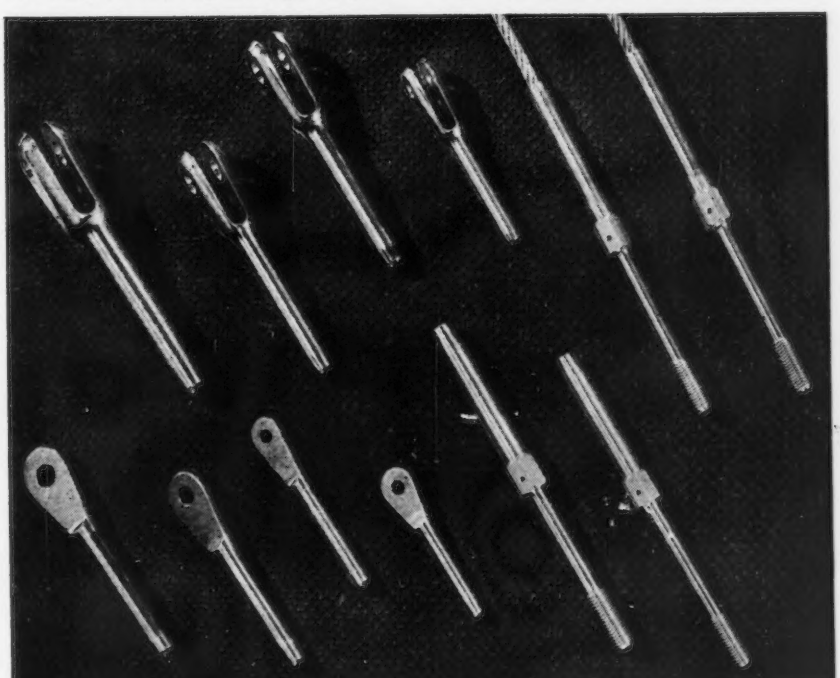
In the face of these problems, Roebling's is making these parts quite successfully. A few simple methods are followed; methods which would make for accuracy on any material but are especially applicable to stainless.

The first essential is absolutely uniform steel; steel that always behaves properly in the machines. A large proportion of the stainless used by Roebling's for this job comes from the specialist in stainless steels, the Rustless Iron and Steel Corporation.

An overall control principle which applies alike to every operation is: "Do not be gentle with stainless". Whether they are severing the metal by cutting or compacting it by swaging, Roebling's men always apply plenty of power.

The reason for this is that this grade of stainless tends to work harden ahead of the tool. Each successive "bite" therefore must get beneath the work hardening left by its predecessor. Cutting tools should have heavy feeds; otherwise too much of the chip area will be of work hardened steel and the tools will burn up. Swaging tools must have force enough so they are compacting metal beneath the surface layer which has been hardened by previous impacts.

After the terminals are swaged to steel cables, the entire assembly is proof tested to 60% of its minimum breaking strength. They must stand this test with extremely limited elongation. Variations in the strengths of the stainless steel fittings, then, would mean scrapping not only of these completely finished parts but also (in many cases) of the cables as well. In fact, the high and uniform strength of stainless coupled with excellent ductility is one of the principal reasons for using it on these cable ends.



Several million fittings of assorted types have been machined from stainless steel Type 303 for aircraft control cable terminals by various manufacturers. Corrosion resistance, high strength, ductility for cold swaging, combined with machinability, are the major reasons for the use of this type of stainless.

On the Automatics

The sizes of stainless steel bar stock used as raw materials, run from 13/16" down to 7/32" round, and 3/16" to 3/8" hex.

First operations usually are performed on automatic screw machines, with shank diameters machined to tolerances of plus .000" minus .003", lengths of cuts held to plus .000" minus .020".

The rake and clearance angles of tools are highly important, since the first rule of stainless machining is to keep all tools perfectly ground and perfectly set.

Roebling's has found the recommended tool angles on page 7 of the Rustless book, *"Shop Notes on the Machining of Stainless Steel"* quite satisfactory. (That book, which was one of the most understandable and useful ones in the shop, has just been replaced by a new and much more comprehensive Rustless booklet, *"Machining Stainless Steels."*)

No chip breaker is used unless the chips produced without one are bothersome or damaging to machine operation. The reason is, the finish is smoother if the chips are not broken. In general, no chip breaker is needed for any cut of less than 1/64" depth, but from 1/64" to the deepest cut of .225" the chips must be broken.

Turning feeds range from .0015" to .0047", with speeds from 70 to 94 surface feet a minute (SFM). The heavier the feed, the less the troubles from work hardening. But if tools show signs of over-heating, the chip pressures must be reduced or other factors modified. Usually the speed is reduced and the feed kept constant.

(ADVERTISEMENT)

Reducing the feed is the surest way to get into work hardening troubles, and these will burn up the tools in short order.

Drilling is one of the difficult operations. The holes, after centerless grinding the shank, must be concentric and parallel with the O.D. to plus or minus .005". And those holes are small and deep.

Spot drilling and inside chamfering are performed at one position, then the hole is drilled to about ⅓ of its final depth at a second position. The final drilling is done on drill presses, a recommended practice which increases automatic screw machine output.

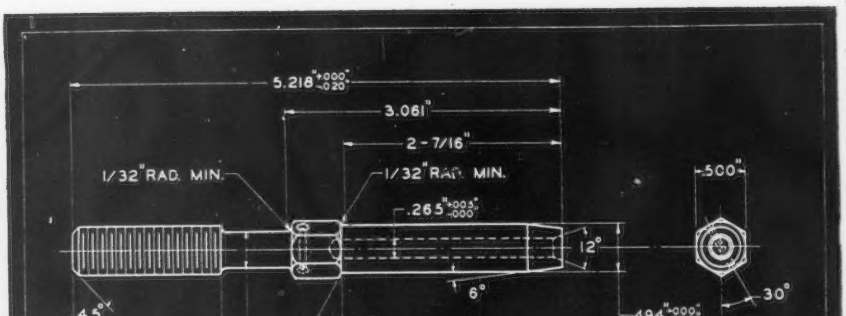
It is important that all drilling on the automatic be done at positions where very little side pressure is being exerted by other tools upon the stock. Such side pressure can make differences as great as .002" and even .003" in the concentricity of the hole.

Operators inspect every piece that comes from the automatics. At the slightest sign that a machine is "crowding the limits" or otherwise threatening to give trouble, the set up man is sent for. Continual inspection is one sure way to avoid trouble. Precision machining of stainless must be kept under complete control.

Centerless Grinding

Many of the precautions taken to insure dimensional accuracy and perfect finish would be as necessary with other steels as with stainless. Some of the centerless grinding precautions are among them.

Centerless grinding usually follows the automatic screw machine operations. The purposes of the grinding are (1) to remove all scratches and tool marks, and (2) accuracy, with sections which are to be threaded being held to plus or minus .0005". To make sure that the grinding gets below all tool marks and leaves a flawless finish, from .005" to .008" of stock is removed.



This terminal is machined from stainless steel, Type 303, at high-production rates. See accompanying text for details of machining operations.

It is important to keep all contaminants out of the grinding coolant. Therefore all work is cleaned and degreased before being taken to the grinder. Any straight cutting oil from the automatics carried to the grinder with the work would change the viscosity of the grinding coolant and might cause the entrainment of steel chips or of abrasive particles with consequent scratching of the work.

The coolant is mixed 20-1 with water, and a special paste is added to increase the lubricity.

Lubricity is needed to make sure that the work is not scratched by the work rest blades. For further protection against scratching, the blades are tipped with an aluminum bronze which is an excellent bearing material; it has very low coefficient of friction when lubricated by the coolant. This bronze has displaced harder and longer lived blade tip materials, with marked improvement in work finish. When badly worn it is restored by a simple welding operation.

The blades are carefully set to a 20° angle. This angle holds the work in position with minimum bearing pressure between work and blades, with consequent minimum scratching if any abrasive gets between the work and the bronze. And at the same time, it permits the coolant to flow off freely, with no surfaces which will entrap loose particles and keep them in position to scratch the work.

Grinding wheels must be dressed often enough to keep up the production rate of the machine and preserve perfect finish on the work. All the grinding must come up to shoulders which bear on one side of the wheel only. The first wheels used, refused to stand the stress of grinding against hex shoulders. Therefore a wheel was adopted which has a 3/16" hard side; the main body of the wheel being 80 N5BE (Norton Company) and the hard side 80 P5BE.

This wheel needs dressing only after every 200 pieces or so, as compared to 75 pieces for the old one. There is a worthwhile gain in daily output as well as in wheel life.

On the Drill Presses

Drilling of the deep holes present two problems: (1) to get the holes concentric and parallel with the O.D., and (2) to complete them to their full depth. Starting the holes accurately is best done on the automatics. But finishing them to full depths requires repeated raising of the drill points from the work and lowering them again, each such cycle being called a "dive". And this diving or pecking motion is most easily accomplished as a secondary operation on a drill press.

Roebling's has found that some holes should be drilled on manually controlled presses, while others can be done on the Leland Gifford Hydromatic Automatic Drill presses. The difference is in the size of the drill. Drills smaller than No. 17 need manual control.

The operator of the manual press must have a sensitive touch. Only by "feel" can he tell when to lift the drill for another dive. Furthermore, he must be careful to raise the drill as abruptly as possible so the drill point does not idle on the work and cause work hardening.

Automatic controls, by contrast, are

Machining terminals on the automatics

set at 3/16" per dive. They lift the drills quickly enough to prevent any troublesome amounts of work hardening.

Crankshaft drills were used originally, but it was found that the Hi-Spiral ones were equally rapid in action and could be re-ground much more quickly.

Grinding of the drill points is important. First of all, the grinding wheel must be diamond dressed to the highest possible accuracy so the point itself is fully accurate. After that, the drill point must be ground to a far more obtuse angle than is used for carbon steel. 140° is about right. (The standard angle is 118°.)

As in all stainless machining, Roebling's finds that it is better to cut down the SFM than the feed if drilling troubles are encountered. Feeds range from .002" to .004", SFM from 40 to 50. Chips should be heavy enough to work up the flutes readily. Light chips tend to get between the sides of the drill and the hole, causing rapid wear of drills as well as spoiled work.

Because of the high cutting temperatures at the drill points, soluble cutting oil has displaced the "straight" kind on this work. The soluble oil also tends to preserve the clearances on the drills longer, and to remove the chips better.

With such accurate control methods, Roebling's is doing some highly accurate drilling. One example is two .272 Dia. parallel holes drilled simultaneously only .024" apart in 13/16" stainless stock.

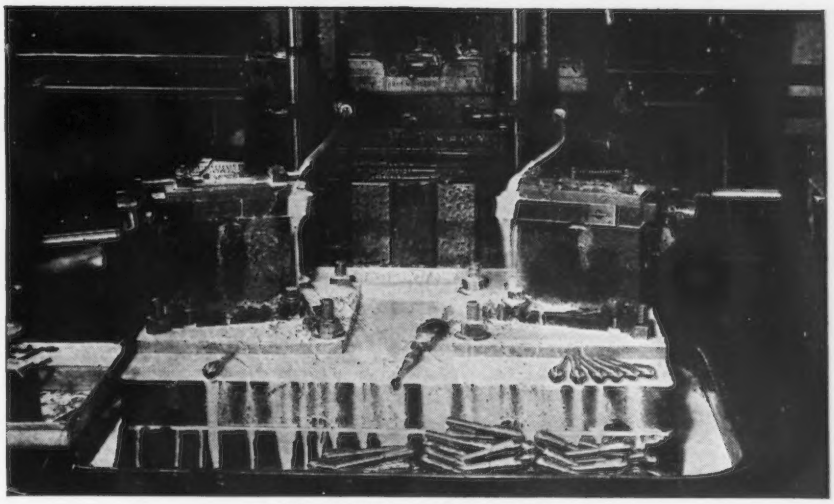
Thread Rolling

The thread rolling is the last major operation, and it is the one which is most easily spoiled by any variations in the stock. Roebling's, of course, cannot do anything more about the steel itself than to make sure that it comes from a steel plant which is rigid about living up to specifications. But Roebling's can—and does—be careful that the sections to be threaded are well within their plus or minus .0005" tolerances. This initial accuracy would be necessary with any metal to roll threads to a class 3 fit, but with a tough metal like stainless it also helps the rolling operation.

Thread rolling, like all other operations on stainless, requires plenty of force. Thus, even on these small parts the No. 20 Waterbury Farrel Machine is not heavy enough for some of the work and the No. 30 does much better.

Speeds must be controlled. A Reeves variable speed drive is attached to each thread rolling machine, and speeds are variable within a wide range. The larger the thread the faster can be the machine speed. Straight cutting oil is used as a die lubricant.

Inspection is close. Work specifications call for a number 3 fit, which means no taper, full size with proper lead and pitch. A comparator is within easy reach of each machine, and every tenth piece is checked by it.



Deep-drilling on the pecker Drills

General Working

Standard grade of high-speed tool steels are used, the only requirement being that the tool must be Rockwell C65 or harder. But this requirement must be observed; softer high-speed steels had only one-third the tool life of the C65 ones.

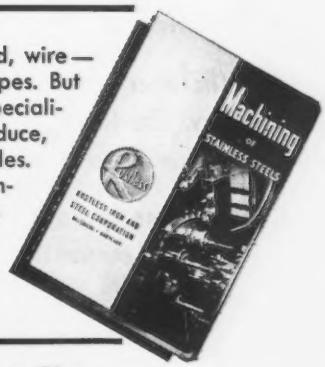
Cutting oil for every operation must be high in lubricity and have no tendency to gum or stick the working parts of machines. All new cutting oil is sterilized before being fed to the machines. Keeping the cutting oil clean and free of entrained metal particles is important. At least 50% of the oil used in the automatics is cleaned in a Barret oil reclaiming and cleaning system every day. Each machine is completely cleaned out at least once for every twenty days of continuous operation. The results include higher production rates, fewer spoiled parts, and almost no dermatitis among operators.

The cutting oil is fed at the maximum pressure which the machine pumps can deliver. It must be carefully guided so the full force of the stream strikes at the spots where the chips impinge upon the tools.

Methods like these keep the stainless production line flowing smoothly. They are helped by the fact that any carelessness quickly shows up in damaged work, and therefore the carelessness cannot be hidden. The machining of stainless steel, in short, is a job for the man who knows how to get his machines under control and keep them that way.

The End

Rustless produces stainless steels only, in bar, rod, wire—rounds, squares, hexagons, flats and special shapes. But we offer you much more than that. By intensive specialization we have learned not only how to produce, but how to select and fabricate the various grades. For example—our machining engineers have completely revised our popular booklet, "Shop Notes on the Machining of Stainless Steels." Copies of the new booklet, mentioned in this advertisement, will be sent free on application.



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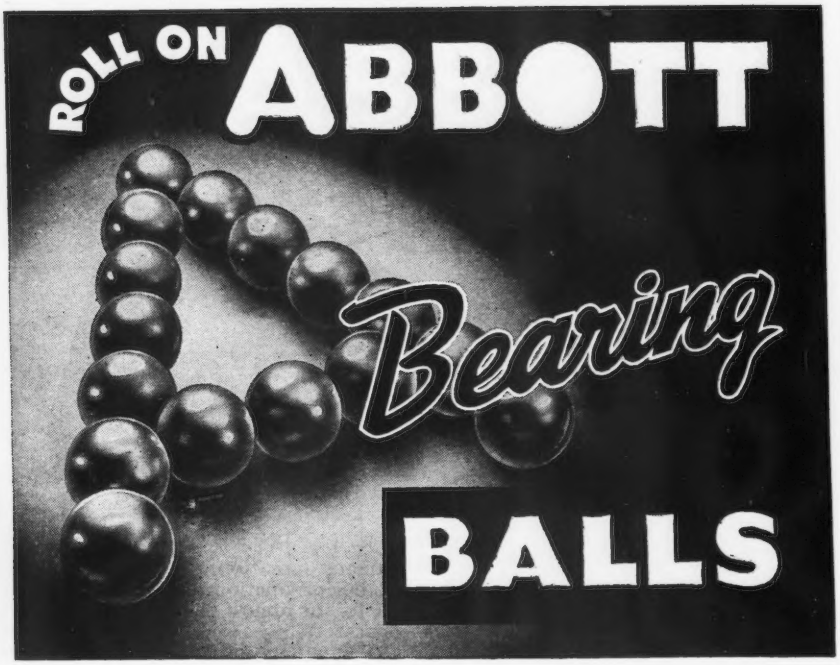
CARRY THE LOAD



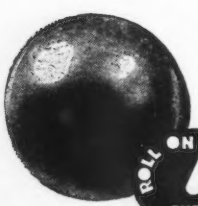
YOU PLAN IT—LET ABBOTT CARRY IT

Some assemblies are more "tricky" than others—require brute carrying stamina — demand unusually close tolerance — and many other sharply defined specifications.

Whatever the specifications, the final requisite is to carry the load as planned. To this, ABBOTT adds, "with uninterrupted performance."

War-time production records, the best of proving grounds, emphatically state that ABBOTT BEARING BALLS have the "built-in" stamina to assure uninterrupted performance... Specify "ABBOTT" and be sure.

UNINTERRUPTED PERFORMANCE



ROLL ON ABBOTT Bearing BALLS
THE ABBOTT BALL COMPANY HARTFORD 10, CONN. U.S.A.

about 11 per cent will employ the same number as in 1939, leaving a balance of 84 per cent of the manufacturers throughout the state planning for a postwar job increase.

Most of the companies will move to new high levels of peacetime employment and offset the downward pull of the five per cent that have poor prospects. The net result of this should be about 265,000 more jobs.

Budd Announces New All-Room Sleepers

Philadelphia

• • • **The Edward G. Budd Mfg. Co.** announced recently that its engineers have completed the design of a new all-room railway sleeping car, to be known as the "Cabin Car."

The new car, which will have 22 rooms, all on one level, the announcement said, is intended to satisfy the need for individual day-and-night accommodations for private occupancy.

Announcement of the cabin car follows closely upon the disclosure that the Budd Co. proposes to undertake the manufacture of a diversified group of modern, streamlined, stainless steel passenger cars, including all types of sleeping car equipment, as well as coaches, diners and observation cars, capable of being assembled into well-rounded train units.

The new cabin car will be followed shortly by other all-room sleeping cars, of striking new designs, it was disclosed.

The 22 rooms are built into a standard 85-ft. car and the beds 6 ft. 4 in. long and 35 in. wide. The beds are lowered into place and returned to their daytime positions electrically. The bed frames, on which the springs are mounted, are lightweight magnesium stampings, and the mattress 4-in. foam rubber. When the bed is in place for the night, a night table, a case for valuables and a combination bed and night light are available.

A chair-type seat is provided for day occupancy. When the arm rests are folded, the seat is wide enough so two people may occupy it. The upholstery is cushioned with foam rubber.

Attention has been given throughout the car construction to accessibility of all equipment to provide low cost servicing in a minimum of time for high mileage runs. The car body is of Budd standard stainless steel construction. High tensile stainless steel is used throughout for main structural members.

MACHINABLE METAL for Shafts that Drive Tractors

TAKE this sprocket drive pinion shaft. It transmits power from the transmission to the tracks of an International Crawler Tractor. It must be tough and durable to stand up under the strain of tractor operation and yet it must be machined to close tolerances. A tough production problem?

Not for Sulphite-Treated Steel.

Here is a metal that sacrifices nothing in strength and durability but is far more machinable than ordinary steel of equal strength. It is successfully used in all kinds of products, from crankshafts to shells. In every case machining operations are made easier, faster and at lower cost. Tool life is increased as much as 200%, saving both time and labor.

Your product may be one more application for this machinable steel. Let our sales and metallurgical staffs investigate the possibilities of solving your production problem with Sulphite-Treated Steel.

WISCONSIN STEEL COMPANY

180 North Michigan Avenue — Chicago 1, Illinois

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at **AMERICAN FORGING & SOCKET CO.**
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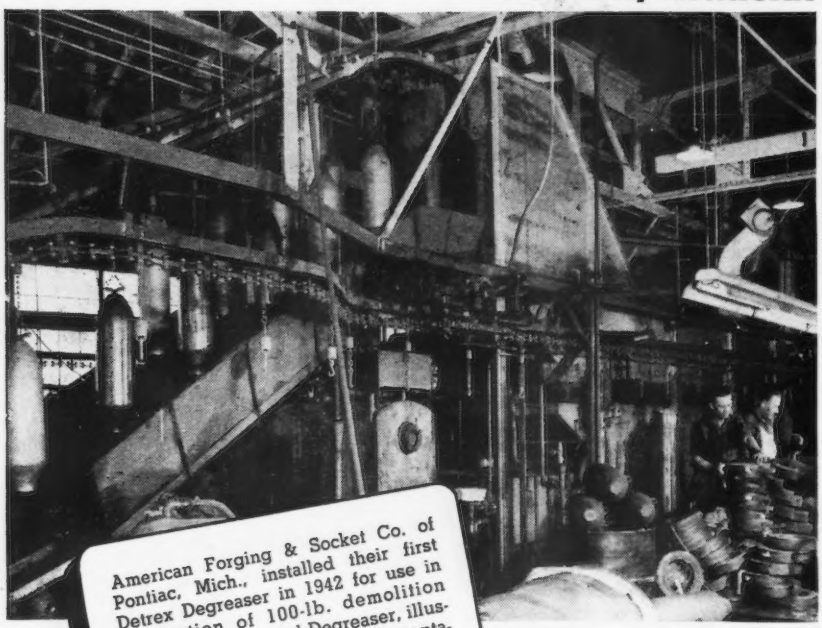

American Forging & Socket Co. of Pontiac, Mich., installed their first Detrex Degreaser in 1942 for use in production of 100-lb. demolition bombs. Their second Degreaser, illustrated, is handling 260-lb. fragmentation bombs.

Detrex

DEGREASERS CAN BE QUICKLY RECONVERTED

THIS company's peacetime products include a variety of stampings made up into assemblies for the automotive industries. When manufacture of such parts is resumed, their present Detrex Degreasers will fit right into the production picture. Parts to be cleaned will be loaded into baskets carried by the same hooks on the same conveyors that are now carrying bomb forgings, and the only alteration required will be a possible change in the conveyor speed.

In the same way, ALL Detrex Degreasers are readily adaptable to changing production needs—whether for war or peace—usually with little or no alteration.

In speed, thoroughness, economy—in adaptability, too—Detrex is your best buy in industrial metal cleaning.

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Solvent Degreasers • Metal Parts Washers • Processing Equipment • Industrial Cleaning Chemicals

Aid in Establishing Private Enterprises Offered in Manual

Washington

• • • "Establishing and Operating a Metal Working Shop," a 200-page book released by the Department of Commerce, is the first in a series of authoritative small business manuals prepared by the Bureau of Foreign and Domestic Commerce for the guidance of those who plan to establish enterprises of their own. The manual was initially prepared at the request of the War Department for use in certain educational activities of the Armed Forces and distribution was limited to men and women on active duty in the service.

An increasing number of inquiries received by the Bureau of Foreign and Domestic Commerce and the field offices of the Department of Commerce indicated wide public interest in the series of manuals. In order that civilian conditions might be made available for general public distribution, the War Department authorized the use of the original type and halftones by the bureau.

Various authorities in the metal working industry cooperated with the authors in preparation of the manual, which covers general repair and service shops, welding shops, sheet metal working shops, ornamental iron works, combination shops and mobile shops.

All factors connected with the establishment and operation of a metal working shops are discussed—choice of location, capital investment, organization of the business, type of building and layout, getting business, unusual sources of business, credits and collections, record keeping, etc.

Copies of the manual may be obtained from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C., or from any of the field offices of the Department of Commerce at 35c. each.

Prime Contracts Decline

Cleveland

• • • During the past five weeks, $67,545,547 worth of prime war contracts placed by government procurement agencies with 52 companies in the Cleveland area, have been cleared by the Cleveland Production Urgency Committee. In April, the committee cleared the placement of $68,374,123 worth of contracts.

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Illustration shows a 6-spindle Acme Gridley Automatic, on which Permite Permanent Mold Aluminum Cast Master Brake Pistons are being machined at the rate of 1200 per hour.

Permite Permanent Mold Castings save time—labor—and overhead. You have less metal to remove. Greater tensile strength often permits thinner cross sections, giving you less weight in the finished part. Recommendations and estimates submitted without obligation.

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PERMITE ALUMINUM ALLOY CASTINGS

Directions 58, 60, 65 To CMP Revoked by WPB

Washington

• • • **Directions 58, 60 and 65** to CMP Regulation 1, which required producers to give notice to WPB of their intention to schedule "Z" (deferred) orders so that this capacity could be used, if possible, for additional production of urgently needed items, were revoked recently by WPB. These directions were revoked, WPB explained, because of easing of the supply situation relating to these materials.

Direction 58 required that at least five days before scheduling for production any order identified by the symbol "Z-1," a brass mill had to give notice to WPB of its intent to schedule such an order, and that no brass mill could schedule a "Z-1" order unless it had so notified WPB.

Attaches Visit Irvin And Homestead Works on Tour

Pittsburgh

• • • **Military attachés**, representing 25 foreign governments in Washington, visited the Irvin works and Homestead works of Carnegie-Illinois Steel Corp., last Friday, on their tour of a number of war plants.

They were accompanied by the Foreign Liaison Officer of the War Department General Staff, Lt. Col. O. T. Jamerson, G. S. C., and his assistants, Lt. Col. R. W. Weaver, G. S. C., and Lt. Col. R. N. Greathead, Jr., G. S. C.

The following military attachés, all officers in their countries' armies, were in the party: Maj. Gen. Birger Ljungber, Norway; Air Commodore J. L. Findlay, New Zealand; Maj. Gen. Ilia Sarayev, USSR; Col. Wlodzimierz Onacewicz, Poland; Group Capt. W. Garing, Australia; Col. Kenneth Mackessack, Great Britain; Col. Guy V. Gurney, Canada; Col. Roelof Roos, Netherlands; Group Capt. Witold A. Urbanowicz, Poland; Capt. K. A. Ostby, Norway; Col. W. L. Breyton, France; Col. Karel Lukas, Czechoslovakia; Col. Hassan Aktarzendi, Iran; Col. Sin-ju Pu Hsiao, China; Col. K. S. Himmatsinhji, India; Lt. Col. Kharb Kunjara, Thailand; Lt. Col. Fernando Camino, Spain; Lt. Col. Thord C. Bonde, Sweden; Lt. Col. Gilbert Vandenbroucke, France; Lt. Col. Jean A. Notz, Switzerland; Lt. Col. Ko-tsan Wang, China; Major Cemal Aydinalp, Turkey; Major Count Baudouin de Borchgrave, Belgium; Major Miodrag R. Blagojevich, Yugoslavia; and Major Stanley L. M. Eskell, Australia.

Vanadium and Cobalt WPB Orders Revoked

Washington

• • • **WPB has revoked** orders M-23-a and M-39, affecting vanadium and cobalt which required reports on sales of vanadium in excess of 500 lb. monthly, and cobalt in excess of 1000 lb. Relaxation of controls on cobalt are said to stem from increased shipments from the Belgian Congo and the resumption of operation of the large cobalt-producing plant at Antwerp, Belgium.

Wooster Brass Buys Two Eastern Plants

Cleveland

• • • **Purchase of two eastern** brass companies, the William Yerden Co., and the M. H. Hart Co., including equipment and patents, was announced this week by John C. Schellin, president of the Wooster Brass Co. It is planned that the acquired equipment will be moved to Wooster and production started within 90 days as part of the postwar program of the Ohio plant.

Located at Fort Plain, N. Y., the William Yerden Co. manufactured hose clamps and the M. H. Hart Co. at Hartford, Conn., produced fire hose nozzles.

Regulation I Is Clarified

Washington

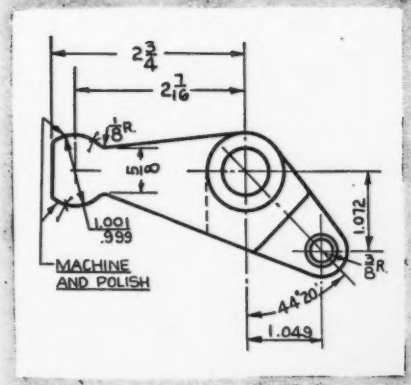
• • • **Issued by WPB**, an amendment to Interpretation 10 to CMP Regulation 1, clarifies the definition of what constitutes a new order when a customer wishes to make a change in an authorized controlled order with a producer. The interpretation says that in no case does a change in shipping destination constitute the placing of a new order.

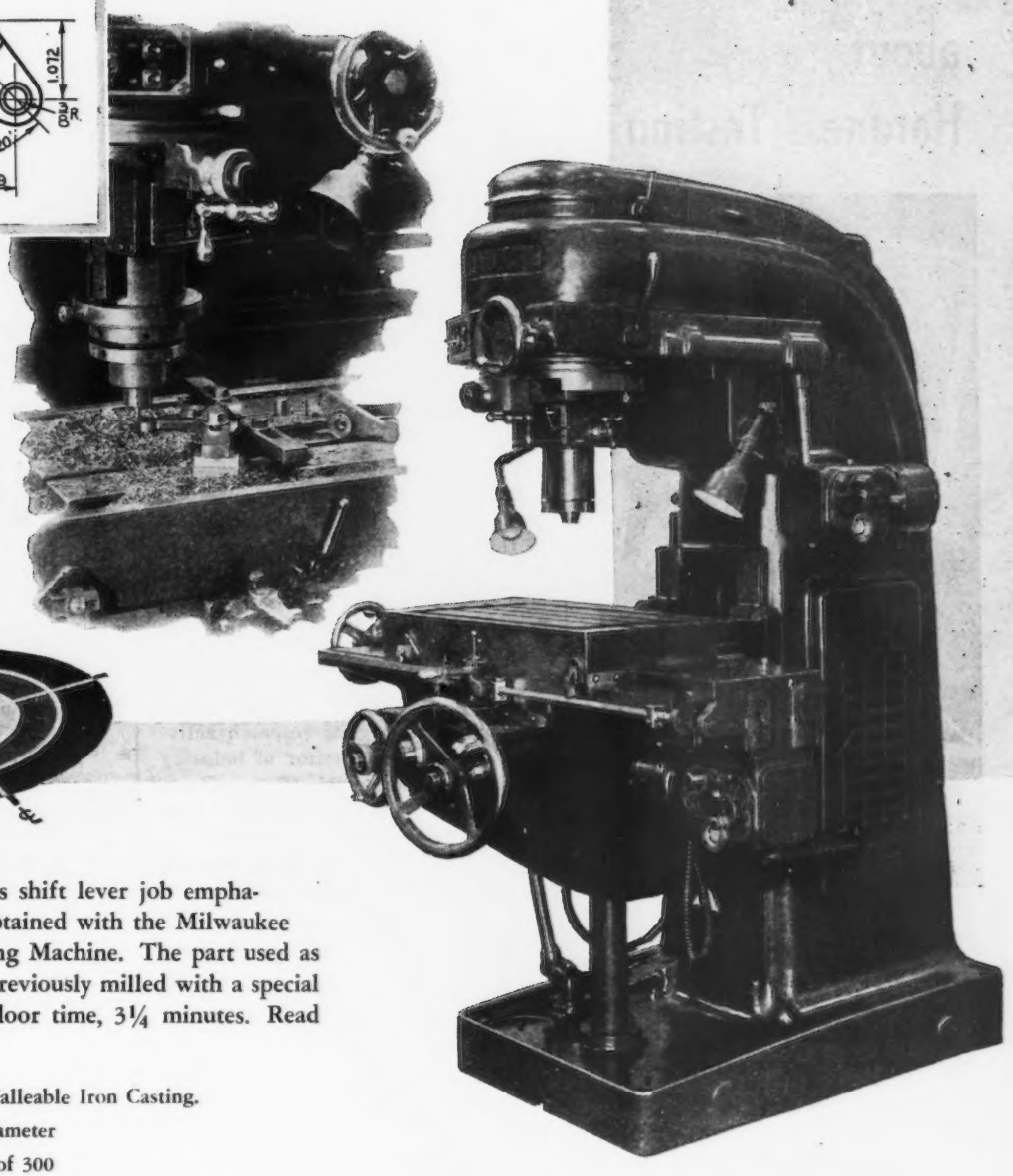
New orders include the following:

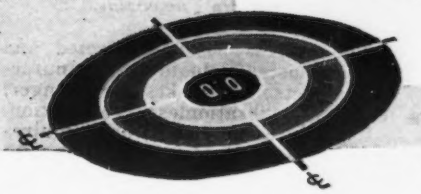
(1) An increase in the total amount ordered, to the extent of the increase; (2) an advancement or deferment of delivery, when made by a customer; (3) instruction to a producer by a customer, to reinstate a suspended order.

Interpretation 30 to the regulation explains rules for the transfer of purchase orders, including rated purchase orders, when allotments are transferred under CMP Regulation 1. The interpretation explains the conditions under which the transferred purchase order retains its position on the supplier's order board.

Can you Save 1½ Minutes on Each Shift Lever ?







The case history of this shift lever job emphasizes the time-saving obtained with the Milwaukee 2D Rotary Head Milling Machine. The part used as an example here, was previously milled with a special form cutter: floor to floor time, 3¼ minutes. Read this job report:

Shift Lever Material — Malleable Iron Casting.

Operation — Mill 1" diameter

Number of Pieces — lots of 300

Initial Setup Time — 20 minutes

Rough and Finish Mill — Stock removed ⅛" on the diameter

Floor to Floor Time — 1¾ minutes

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FAST . . . initial job preparation and setup time are reduced to the minimum. Accurate performance of the machine saves operator's time and results in rapid production of work otherwise difficult to perform.

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Dearborn Predicts A Shortage of Research Men for Small Firms

New York

• • • Postwar expansion of research by small companies will be limited by the scarcity of scientific and technical men, R. J. Dearborn, president of Texaco Development Corp. and chairman of the Patents Committee of the National Association of Manufacturers said recently. The greatest increase in research is contemplated in concerns employing less than 50 persons.

The principal factor in the prospective shortage of professional men available to industry is that the war has prevented the normal flow of trained young men from the colleges. Another, Mr. Dearborn stated, is that many men in the services or in war jobs will find it difficult to resume their old work due to disuse of their technical abilities. Training of scientists in the colleges has almost come to a standstill, it was pointed out, and it has been estimated that the normal flow of technical graduates cannot be resumed until 1950.

Another factor which will affect industry is that the government probably will intensify its research activities and be a competitor of industry for scientific personnel. Research expenditures in the United States before the war were estimated at $250 million a year, only $50 million of which was spent by government. More than $600 million now is being spent yearly by more than 40 government agencies and bureaus for research in their own laboratories or through contracts with private organizations and educational institutions.

In addition, there will be a great demand for technical personnel abroad due to the tremendous reconstruction work which will be needed and also from the colleges for teachers, the NAM committee head emphasized.

Zinc Shipments Drop in May

New York

• • • Shipments of slab zinc continued to drop in May according to the American Zinc Institute to a net tonnage of 66,982. This represents a drop of nearly 8000 tons since April and indicates how requirements for zinc are declining at this stage of the war effort. The stockpile at the end of May totaled 170,997 tons which may be compared with a big stock of over 246 thousand tons at the end of November last year.

(*Advertisement*)

Many Industries Adopt Galv-Welding

By GEORGE H. OHMER
Chief Engineer

Dayton

• • • All welded fabrication from galvanized sheet, plate and pipe, heretofore fundamentally unsound, the galvanizing burning away at the point of welding, has been made practical by the patented Galv-Weld Process.

The weld and adjacent damaged area are quickly coated while welding, using the residual heat to flow on Galv-Weld Alloy, permanently insuring 100% protection against rust and corrosion.

INLET AND OUTLET PORTS *on these paint spray tanks for U. S. Signal Corps, were welded on after hot dip galvanizing.*

The process obsoletes riveted and bolted construction, lowers manufacturing costs; and makes for stronger, leakproof, vibrationless construction.

It produces no fumes, and requires no sand or grit blasting, no flux in application, nor special equipment. The alloy, in bar form, may be applied in all positions, and confined quarters. The coating will not chip, peel or crack even when the base metal is stressed beyond its elastic limit. Fractures in galvanized coating due to forming, are easily coated.

Official government tests proved Galv-Weld Alloy equal to and/or better than hot dip galvanizing in corrosion resistance, not only passing the standard salt spray requirement of 200 hours, or about eight days, but remaining in test for a period of 141 days without failure. Galv-Welded joints have withstood more than eight years' exposure in salt air mists along the Atlantic seaboard.

Railroads are employing the process in construction and repair of water tanks, signaling systems, towers, and piping. Not affected by the corrosive, acid bearing fumes in refinery areas, Galv-Weld Alloy is used in maintenance of refinery equipment. All-welded galvanized steel buildings have been made feasible. The process is a "must" for underground storage tanks. Electric power companies are redesigning transmission towers to utilize welded rather than the conventional bolted type of construction, obtaining greater strength, ease of erection and lower cost.

Manufacturers are invited without cost to submit products for producing examples of Galv-Welding. Details may be secured from Galv-Weld Products, Dayton 10, Ohio.

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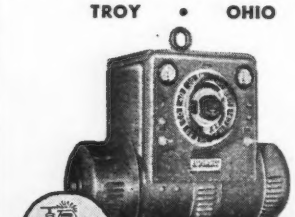

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Non-Integrated Producers Carry Fight to Congress for Law Amendment

By D. J. ANSBORO

Washington

• • • **Inclusion of administrative** and distribution costs in computation of ceiling steel prices was requested by non-integrated companies before the House Banking and Currency Committee on July 14. The committee was requested to pass legislation requiring such consideration by the OPA in cost computations.

According to spokesmen representing 30 of the non-integrated companies, special price relief granted individual companies has failed to remedy the situation confronting the industry. They asked that Congress amend the Emergency Price Control Act requiring the OPA to include certain expense factors in arriving at industry wide prices.

In enforcing the provisions of the act, steel witnesses said, the OPA has interpreted them so that the marginal profits are stated on the basis of "out of pocket costs," no provisions being made for administrative or distribution expanses. The OPA was criticized for having computed prices on a heavily weighted basis, distorted by the cost position of the larger integrated companies. The May 21 adjustment of carbon steel product prices, the committee was told, was based on a study of cost figures obtained from 21 steel companies, including low cost producers but eliminating high cost or "fringe" producers. Emphasis also was placed on the contention that OPA did not take into consideration the WLB wage adjustment as it related to inequities and had underestimated the cost of vacation and shift differential pay.

It was pointed out that the $2 per net ton price increase on sheet bars granted in May had resulted in continued losses of from 11c. to 20c. per ton on sheets even after the corresponding increase in carbon sheet prices. This was attributed to increased production costs and conversion losses.

With the cutbacks in wartime production, steel executives said the non-integrated mills face serious financial difficulties in the transitional period.

Opening the steel companies' case was Lauson Stone, president, Follansbee Steel Corp., Pittsburgh. The other witnesses were: Robert W. Wolcott, president, Lukens Steel Co., Coatesville, Pa.; R. K. Clifford, vice-president and general manager, Continental Steel Corp., Kokomo, Ind.; John F. Budke, president, Parkersburg Iron & Steel Co., Parkersburg, W. Va.; H. W. Boal, vice-president and treasurer, Andrews Steel Co., Newport, Ky.; David Thomson, president, Phoenix Iron Co., Phoenixville, Pa., and D. V. Sawhill, president, Mercer Tube & Mfg. Co., Sharon, Pa.

Burdens which witnesses said must be overcome were comprehensively summarized by Mr. Clifford. He urged a five-point plan for amending the Price Control Act, as follows:

1. To provide that in no event shall a maximum price be maintained or established for any commodity which does not return to the producers or manufacturers of that commodity the average cost of producing and distributing such commodity. Statutory provisions which enable OPA to grant individual relief where necessary, of course, should remain, to take care of individual cases which require such relief under this revised commodity standard.

2. To provide that in computing such cost the term cost shall be defined to include labor, materials, overhead, sales and advertising expense, administrative expense, depreciation and all other expense allowed as deduction by the federal income tax laws. Such costs to be allocated to the commodity in accordance with sound accounting methods.

3. In connection with labor cost, the statutes should direct OPA to give consideration to all wage adjustments ordered by the National War Labor Board or other authorized federal agency which are applicable to a substantial portion of the producers of any commodity. Where the amount of any such adjustment is not ascertainable immediately, OPA should be required to give effect to such adjustment on a fair estimated basis, subject to revision when the amount of adjustment is definitely ascertainable.

4. To provide that in determining the average cost of producing and distributing any commodity, the OPA shall make such determination

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on a basis which reflects the average cost for typical producers of such a commodity, excluding peculiarly high or low-cost producers.

5. The requirements that maximum prices shall be generally fair and equitable should be retailed. Under established OPA policy, this requirement means that where overall industry earnings decline below earnings for a representative base period, general industry price relief shall be granted.

Mr. Wolcott declared that "OPA has fanatically attempted to control profits, not prices." After citing other elements of costs which he said had been disregarded, Mr. Wolcott insisted that accelerated amortization of war facilities which are allowed as a tax element should be included as a cost element. Experience, he added, will tend to discount OPA's reason for disallowing them on the theory of postwar utilization. Mr. Wolcott pointed out that the OPA position that it has not the authority to make adjustments based on estimates of future conditions doesn't apply under conditions confronting the industry.

"During the first four months of 1945, for which we have figures, earnings would have practically disappeared and, if any costs at all accrue from the application of the Labor Board Order on elimination of wage rate inequities, which no doubt will be inescapable, this plant will be unable to operate, except at a loss," Mr. Wolcott said.

Mr. Boal said that the $2 price increase in sheet bars in the first quarter of 1945 increased the Andrews Company's cost of hot rolled carbon $2.11 a ton, resulting in a 11c. per ton loss since the sheet price also was increased only $2.

Mr. Thomson told the Committee that OPA has controlled the price of structural steel shapes at a ceiling of $42 per net ton f.o.b. at the government or emergency basing point. In enforcing the provisions of the Emergency Price Control Act he said the OPA has interpreted it so that marginal profit of the products produced is stated on the basis of out-of-pocket cost only, no provision being made for administrative or distribution costs. Any single line producer, Mr. Thomson declared, must take into consideration these costs which are recognized for Federal tax purposes.

Mr. Budke said that individual relief which has been granted in some cases will not be effective during postwar. In the absence of price control the great demand would probably create a price sufficiently high to permit small steel companies to survive, he said.

"Presently we do not prefer to be liquidated by a formula or be decapitated by a computation," he said. "The Congress should provide the OPA with authority to establish price which are consistent with proper control, which reflect potential demand and as well as increased production costs."

"In the study leading up to present adjustments on steel prices, it is our understanding that cost figures were obtained from 21 steel companies, including low cost producers, but eliminating high cost of so-called 'fringe' producers," said Mr. Clifford. "Selling and administrative expenses were also eliminated as cost factors by OPA. Neither was any account taken of the inequity wage advances prescribed by NWLB. The May 21 revision, however, took away most of this relief by advancing the price of sheet bar $2 per ton. Since a ton of sheet bar will not produce a ton of finished sheets due to conversion losses, our sheet costs were increased approximately $2.20 per ton or 20c. per ton more than the relief on hot rolled sheets; and the already inadequate $3 per ton interim relief on galvanized sheets, though increased by the new order to $4 per ton, was, in effect, reduced to less than $2 per ton by the one raw material sheet bar price increase."

Carnegie Farrell Plant Resumes Tank Production

Youngstown, Ohio

• • • **Operations were resumed** this week at the Carnegie-Illinois Steel Corp.'s Farrell Ordnance plant on a reduced schedule as 500 employees were recalled for tank armor production.

It was reported here that operations were suspended to take inventory and plan for production of sharply reduced requirements for tank armor. Cutbacks in armor plate orders following V-E Day resulted in an accumulation of completed orders in the plant which at peak production employed more than 1650 workers.

With the exception of the machine shop and heat treating department, the plant will operate a day shift only.

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MACHINE TOOLS

. . . News and Market Activities

SPB Warns of Machine Tool Surplus

Washington

• • • **The supply of machine** tools which may become surplus after the war represents a quantity greater than 30 years' production before the present war and comprises approximately 750,000 individual tools which are now being used by 90 per cent of metals producers in war production activities, Robert A. Hurley of the Surplus Property Board told the War Contracts Subcommittee of the Senate Committee on Military Affairs on June 14.

Marking the first appearance of SPB members before the Subcommittee headed by Senator J. C. O'Mahoney, Democrat, Wyoming, former Senator Guy M. Gillette, retiring chairman, pointed out that one feature of leasing provisions applicable to government owned plants might lead to "monopolistic practices." Asserting a different opinion, however, Mr. Hurley asserted that the fundamental idea behind the leasing arrangements was to provide for maximum employment particularly in the transition period now in progress.

Terming a great deal of the surplus "nothing more than junk," Mr. Hurley expressed the hope that the bulk of it may be disposed of on the spot without a great deal of paperwork and inter-agency red tape. Consumer goods, he said, should be disposed of wherever possible through regular trade channels.

Estimating the total cost of removing machine tools from war plants in which they are being used at around $750,000,000, Mr. Hurley, said that the SPB was engaged in a big selling job intended to keep up employment through orderly distribution of surplus tools and to secure the best dollar return for the government.

W. Stuart Symington, newly appointed SPB Chairman was examined by the members of the Subcommittee in connection with his taking up the new post. Mr. Symington was formerly connected with the Rustless Iron Corp., Baltimore, having resigned in 1937 when he joined the Emerson Electric Co., St. Louis.

o o o

Proper Personnel For Disposal of Machine Tools Poses Problem

Cleveland

• • • **With the recent** announcement that RFC will soon set up plant clearance units to function as integral part of their local disposing loan agencies, there arises the question of manpower.

It is planned that plant clearance units will move into contractors plants immediately following cancellation of contracts and make an appraisal of all government-owned equipment and decide what is to be warehoused and sold and what is to be scrapped. To say that this process will require considerable judgment is something of an understatement, according to opinion here.

Real machine tool men will be needed for this job, but at the present time, while it is recognized that their assistance is needed, the prevailing rate of pay is the customary $6.00 per diem, which is said to hardly amount to an intriguing inducement for any of the some 45,000 men the industry employs, even though the offer is placed on a quasi-request basis.

Machine tool dealers, in many cases it is said, could be an invaluable help, but their men, often as not, have been carefully trained over a period of years and their background suggests that $6.00 per diem does not constitute a realistic approach.

A. B. Einig, general manager of Motch & Merryweather Machinery Co., and author of the first pool order, obviously a man who knows machine tools, said recently that dealers would doubtless be very glad to help but hardly at that rate of remuneration.

There are no indications at this moment that dealers of the original builders of the machines are going to be called into the picture. And if this condition holds, where the needed personnel is going to come from becomes almost an unanswerable question from the aspect of quick disposal.

If things don't go right for a couple of years, there will be, according to Mr. Einig, big private sales, in which equipment will go cheaper than the surplus owned and sold under the Clayton Formula. No one will bid above the Clayton Formula which may easily mean that the government-owned equipment will be held over the market for the next ten years.

A plant clearance unit is now in the process of formation by this same agency. Its object will be to coordinate disposal activities in contractor's plants to effect a quick return to civilian production. RFC will be notified in the future as soon as a contract is canceled, bringing the plant clearance unit into play, by moving in and appraising every piece of DPC equipment and deciding whether it is to be warehoused and sold as surplus, or scrapped.

•

RFC Offers Tools Under Sealed Bids

Washington

• • • **RFC has announced** that it is offering to sell bench and engine lathes; boring mills, metal-working equipment; milling, broaching and other machine tools; welding equipment; and staple-forming machinery on June 26, when sealed bids will be opened.

The equipment items have been used, but most of them RFC said, are in excellent condition. Interested purchasers can get complete information on the items by writing the Richmond, Atlanta, Charlotte, Boston, Cleveland, Detroit, New York, St. Louis, Chicago, Kansas City, Mo., or Minneapolis RFC Disposing Agencies for Special Listing No. S-100. The items are located at:

Naval Ordnance Plant, Elkton, Md.; Timmonium Engineer Warehouse, Timmonium, Md.; Chemical Warfare Center, Edgewood Arsenal, Md.; Aberdeen Proving Grounds, Aberdeen, Md.; Naval Torpedo Station, Alexandria, Va.; National Bureau of Standards, Washington; Richmond Army Service Forces Depot, Richmond, Va.; Naval Supply Depot, Norfolk, Va.; Norfolk Navy Yard, Portsmouth, Va.

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NON-FERROUS METALS

. . . News and Market Activities

July Copper Needs May Continue Drop

New York

• • • **Copper producers** report further reduction in requirements for July copper, although expected to continue well above domestic production. This does not apply to Lake copper, demand for which continues at peak levels.

The current modification of the copper order M-9 has done much to clarify the confused supply picture. Purchase of copper up to a 30-day inventory limit is now permitted without authorization. However, copper may not be used to fill unrated orders if this would interfere with the production of CMP orders or other authorized production. Brass mills are no longer required to file forms WPB 2954 and 3007. Further simplifications in reporting may be anticipated soon, according to WPB officials.

Limitations on inventories of copper and copper bearing scrap have been revoked, and the prohibition against processing of copper base scrap by others than those producing copper raw materials or controlled materials has been discontinued.

Misapprehension has been current as to the need for production of unrated orders from domestic copper. There is nothing in the order to require segregation of stocks of domestic and imported copper at the present time.

•

Revises Instructions On Brass Mill Warehouse Stocks

Washington

• • • **Issued on June 13** by WPB, Direction 8 to CMP Regulation 4, gives instructions to brass mill warehouses on how to replace, establish or increase their stocks. The direction also provides that brass mill warehouses and brass mills are no longer required to file Form 3007 on warehouse shipments unless specifically instructed to do so by WPB. It revokes all previous instruction and directions dealing with the replacement, establishment or increase of warehouse stock.

Direction 8 says that a warehouse may place "warehouse stock replacement orders" to replace brass mill products (equivalent metal weight) previously delivered from warehouse stock on authorized controlled material orders (except "Z" orders) in accordance with CMP Regulation 4. If the brass mill products were delivered on "Z" orders, the warehouse may replace these products under the same conditions by placing "warehouse deferred (ZW) orders."

•

Increases Made In Lead Tube Quotas

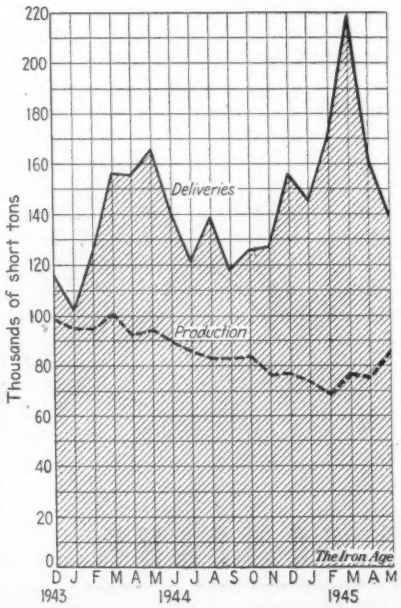
New York

• • • **Three million** additional collapsible lead tubes will be made available for civilian use during the Second Quarter as a result of direction 2 to order M-115.

Quotas of tube manufacturers have been increased by 20 to 25 per cent of the lead authorized for the corresponding quarter of last year for dental preparations, and by 40 to 50 per cent for synthetic and natural rubber cement and pyroxylin cement.

While WPB attributes the action to lead being made available by army cutbacks, factors in the industry see no evidence of an approaching lead surplus.

COPPER PICTURE: *The Copper Institute reports a refined production of* **85,319** *tons in May and deliveries to customers of* **139,203** *tons.*



Lift Zinc Restrictions; Supply Continues Tight

Washington

• • • **All restrictions on** the use of zinc have been removed through revocation by WPB of conservation order M-11-b and Direction 1 to the order. Existing allocation controls on slab zinc will be retained since zinc continues in tight supply.

The recent cutbacks in brass mill production reduced the deficit between essential requirements and supply by approximately 75 per cent. Zinc that can be obtained on an unrated basis after the fulfillment of all rated orders may be used for any purpose. However, in the immediate future, WPB said, there will be very little zinc available for unrated civilian demands.

•

Reynolds Considers Purchase of Plant

Louisville, Ky.

• • • **The Reynolds Metals** Co. is giving consideration to the purchase of the Curtiss-Wright plant here. The present Reynolds operations are distributed over many buildings in this locality and it is anticipated that better organization would result from consolidation. The Curtiss-Wright plant is scheduled to close its operations in September.

•

Nickel Supply Easing

New York

• • • **While War Production Board** releases and statements continue to stress shortages of certain materials, including nickel, there is some evidence that the nickel supply position is easing somewhat. Reports from Canada indicate that stocks of nickel have increased substantially at Port Colborne since Germany's defeat.

•

Aluminum Scrap Tight

New York

• • • **Ingot producers report** the position of aluminum scrap to continue tight at prices somewhat below ceilings. The government's stocks of uncontaminated surplus aluminum scrap are exhausted.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.9%, dollars per troy oz.	$4.00
Iridium, dollars per troy oz.	$120.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$149.00 to $153.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.37	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.00
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S	4.50
25S turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 63S solids	7.50
turnings, dry basis	5.75

Plant scrap, mixed

Solids	4.00
Turnings, dry basis	2.75

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	1.50

Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25⅛
Electrodeposited	18⅞
Rolled, oval, straight	19⅛
Curved	20⅜
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 1-9 troy oz., per oz.	58*

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5, crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver cyanide, 100 oz. lots	—.4179
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 89 per cent, crystals, bbls., frt. allowed	6.35

*Price based on use of foreign silver.

SCRAP

. . . News and Market Activities

Market Strengthens Appreciably in Week

New York

• • • There is some evidence of strengthening scrap prices this week with a leading Eastern consumer entering the market well above the last offered price, and accepting bundles at the same figure as heavy melting scrap. Pittsburgh and Cleveland report that Valley mills are paying $1.50 springboard for out-of-district scrap. Chicago reports that bundled turnings have moved to the ceiling, an increase of better than $2.00. There is also a strengthening in galvanized bundles and machine shop turnings. Detroit reports that open hearth grades seem to be getting scarcer, with mills eager to purchase all available carbon scrap.

For News of European War Scrap, turn to page 78.

•

PITTSBURGH — The scrap market here is marked as routine, with no unusual activity. The short turnings market is stronger, with supplies being relatively short. One dealer indicated that he would soon begin to pay $16 or more to cover commitments. Consumers in the Valley were reported to have paid $1.50 springboard this week for scrap, meaning that they were reaching to Cleveland, Canton and Massillon for items not available in the district. The machine shop turnings market is weak, with only one consumer taking any great volume. Crushers report that the price they are paying on long and short alloy-free turnings is still in the $13 to $13.50 range. Expected cutbacks and the possible release of greater quantities of surplus materials in the form of scrap are causing considerable concern in scrap circles here.

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CLEVELAND—For second week in a row, the market is very quiet. Blast furnace is strong, and short turnings are coming out. However, as one broker put it, "There are too many guys with orders." Two important consumers bought in the Valley and paid a springboard of $1.50, indicating more than any other factor that scrap is still pretty tight.

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NEW YORK — Bethlehem Steel has been placing large orders here for open hearth scrap, including bundles, at ceiling price and is also paying the brokerage commission. This is a substantial change from its recent policy and apparently indicates that adequate supplies were not obtainable at the rates it had attempted to establish. Pittsburgh mills are no longer placing current orders here, but there are contracts still in effect. Turnings continue at a price well below ceiling.

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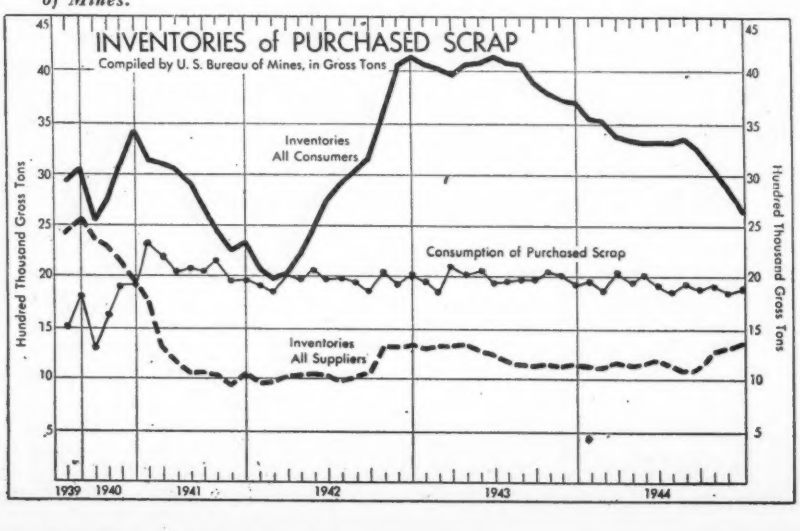
CHICAGO — Bundled machine shop turnings moved to ceiling last week with purchase by a major consumer whose previous buying has been at the former $16.75 level. This transaction carried galvanized bundles to ceiling, also, and buying pressure by balers again brought machine shop turnings to the $12.00 former level with possibility of some further increase. Turnings and some railroad specialties now remain the only grades below ceiling levels. Most mill inventories remain light.

SCRAP INVENTORIES: ***Stocks of consumers and suppliers are compared graphically with the consumption of purchased scrap. Chart prepared by the Institute of Scrap Iron and Steel from statistics compiled by the Bureau of Mines.***



DETROIT—Substantial tonnage of cast iron borings has been bought from a local producer at a price considerably above recent quotations, putting the borings at least temporarily at a price above that of short turnings. Up to now comparatively little demand has manifested itself for this grade. Open hearth grades seem to be getting scarcer meanwhile, due to production scrap diminishing during reconversion. Mills are showing less interest in alloy grades, but are anxious to purchase all available carbon steel scrap.

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BUFFALO—Scrap handlers who shared in the business placed by the chief consumer recently are pushing dleiveries to assure that none of the 30-day contracts lapses. Other mills, however, are buying sparingly, resulting in irregular yard activities. Approximately 70 per cent of the leading interest's order was for heavy steel making material, including bundles. Inquiry for blast furnace grades is slow, but without reflection in the price list. Foundry grades are strong at the maximum market level.

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ST. LOUIS—Sales of a fair tonnage of No. 2 heavy melting steel were made during the week. Receipts continue light, largely because of the shortage of labor to gather and process the material. While consumption is ahead of receipts, mills have comfortable inventories. Through purchasing by outside interests borings and turnings are stronger and higher.

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BOSTON—One Pittsburgh mill is reported as still out of the market for heavy material and shoveling turnings, but others there, as well as in eastern Pennsylvania, are in and taking what they can get at ceiling prices. The $4 spread between shoveling and machine shop turnings continues, a slightly better movement of the latter notwithstanding. Demand for foundry scrap is not, perhaps, as pressing as previously, but sellers have no difficulty in disposing of whatever they have. Yards report labor supply as still unsatisfactory, but car supply perfect.

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PHILADELPHIA — Reports that a large Eastern consumer is purchasing open hearth scrap from Northern New Jersey at ceiling prices has had a strengthening effect on the market here. Although local mills are still getting No. 1 and No. 2 heavy melting steel scrap, at $18.25, the tonnages involved are light. Brokers here expect heavy grades to reach ceiling levels within several weeks. Some buyers are showing willingness to pay ceiling prices for some railroad specialties.

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BIRMINGHAM — Demand for open hearth grades continues to weaken in this market although some tonnages are moving at ceiling prices. Sizable amounts of blast furnace material are being purchased with prices still about $2 per ton under ceilings. Very little interest is being shown for foundry grades.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4). Where ceiling prices are quoted they do not include brokerage fee or adjusted transportation charges. Asterisks indicate grades selling at ceilings.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	$12.00 to 12.50
Short shov. turn.	15.50 to 16.00
Mixed bor. and turn.	12.00 to 12.50
Cast iron borings	14.50 to 15.00
Hvy. break. cast	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	$11.50 to 12.00
Short shovel. turn.	13.00 to 13.50
Cast iron borings	12.00 to 12.50
Mix. borings & turn.	12.00 to 12.50
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	22.50 to 23.00
Cut bolsters & side frames	19.75 to 20.25
Angles & Splice bars	22.25*
Standard stl. car axles	23.50 to 24.00
No. 3 steel wheels	22.00 to 22.50
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast	20.00*
No. 1 agricul. cast	20.00*
Hvy. breakable cast	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$7.00 to 7.50
Shoveling turn.	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Mixed bor. & turn.	7.00 to 7.50
Low phos. plate	22.00*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Stove plate	19.00*
Scrap rails	21.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	10.00
Machine shop turn.	6.00
Mixed bor. & turn.	6.00
Cl'n cast, chem. bor.	$13.06 to 14.15*

Truck delivery to foundry

Machinery cast	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	$6.75 to 7.25
Short shov. turn.	10.75 to 11.25
Cast iron borings	11.25 to 11.75
Mixed bor. & turn.	6.75 to 7.25
Low phos. plate	19.00 to 19.82
No. 1 cupola cast	20.00*
Charging box cast	18.00 to 19.00
Hvy. breakable cast	16.50*
Stove plate	18.50 to 19.00
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.25
No. 2 hvy. melting	18.25
No. 2 bundles	15.75 to 16.25
Mach. shop turn.	9.50 to 10.00
Shoveling turn.	11.00 to 11.50
Cast iron borings	11.00 to 11.50
Mixed bor. & turn.	9.50 to 10.00
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle, forge turn.	17.00 to 17.50
Low phos. plate	20.75 to 21.25
Low phos. punchings	20.25 to 21.25
Billet crops	20.25 to 21.25
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	8.00
Hvy. axle turn.	10.00
Locomotive tires, uncut	17.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	23.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	9.50 to 10.00
Bar crops and plate	19.50*
Structural and plate	19.50*
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50*
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop turn.	$11.50 to 12.00
Short shovel. turn.	15.00 to 15.50
Cast iron borings	14.00 to 14.50

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33
Mach. shop turn.	6.50
Mixed bor. & turn.	6.50
Shoveling turn.	925 to 9.75
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	11.00
Shoveling turn.	14.00
Cast iron borings	12.00
Mixed bor. & turn.	11.00
No. 1 cupola cast	20.00*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00*
No. 2 bundles	19.50*
Mach. shop turn.	$10.00 to 10.50
Short shovel.	14.00 to 14.50
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	13.00 to 13.50
Mixed bor. & turn.	12.00 to 12.50
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.15*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$16.50
No. 1 hvy. melting	16.50
No. 2 hvy. melting	15.00
No. 2 bales	$13.50 to 14.25
No. 3 bales	9.50 to 10.59
Mach. shop turn.	7.00
Elec. furn. 1 ft., und.	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to $15.50
No. 2 hvy. melting	13.50 to 14.50
No. 2 bales	12.50 to 13.50
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$14.50
No. 1 hvy. melting	14.50*
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	17.00
No. 1 cupola cast	20.00*

Comparison of Prices . .

Advances Over Past Week in **Heavy Type**; Declines in *Italics*. Prices are F.O.B. Major Basing Points. The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 150-158.

Flat Rolled Steel (Cents Per Lb.)	June 19, 1945	June 12, 1945	May 15, 1945	June 20, 1944
Hot rolled sheets	2.20	2.20	2.20	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.70	3.65	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.25	2.20	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.25	2.25	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Bright wire	2.75	2.75	2.60	2.60
Wire nails	2.90	2.90	2.80	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	45.00	43.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$36.00	$36.00	$34.00	$34.00
Sheet bars	36.00	36.00	34.00	34.00
Slabs, rerolling	36.00	36.00	34.00	34.00
Forging billets	42.00	42.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.15	2.15	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Latest steel price increase, Amendment 13 to RPS6, effective May 23, 1945.

Pig Iron: (Per Gross Ton)	June 19, 1945	June 12, 1945	May 15, 1945	June 20, 1944
No. 2 fdy., Philadelphia	$26.84	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.00	25.00	25.00	24.00
No. 2, Southern, Cin'ti	26.11	26.11	26.11	25.11
No. 2, Birmingham	21.38	21.38	21.38	20.38
No. 2, foundry, Chicago†	25.00	25.00	25.00	24.00
Basic, del'd eastern Pa.	26.34	26.34	26.34	25.34
Basic, Valley furnace	24.50	24.50	24.50	23.50
Malleable, Chicago†	25.00	25.00	25.00	24.00
Malleable, Valley	25.00	25.00	25.00	24.00
L. S. charcoal, Chicago*	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡ For carlots at seaboard.
Last pig iron price change authorized by OPA effective Feb. 14, 1945.
* Charcoal price increase retroactive to March 7, on contracts to Feb. 13.

Scrap: (Per Gross Ton)	June 19, 1945	June 12, 1945	May 15, 1945	June 20, 1944
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.25	18.00	18.50	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.50	$7.00	$7.00	$7.00
Foundry coke, prompt	9.00	8.25	8.25	8.25
Non-Ferrous Metals: (Cents Per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 19, 1945	2.41571c. a Lb.	$24.61 a Gross Ton	$19.00 a Gross Ton
One week ago	2.41571c. a Lb.	$24.61 a Gross Ton	$18.92 a Gross Ton
One month ago	2.38444c. a Lb.	$24.61 a Gross Ton	$19.08 a Gross Ton
One year ago	2.30329c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.41571c., May 29	2.21189c., Jan. 2	$24.61, Feb. 20	$23.61, Jan. 2	$19.17	$19.17
1944	2.30837c., Sept. 5	2.21189c., Oct. 5	$23.61	$23.61	19.17	$15.67, Oct. 24
1943	2.25513c.	2.25513c.	23.61	23.61	19.17	19.17
1942	2.26190c.	2.26190c.	23.61	23.61	19.17	19.17
1941	2.43078c.	2.43078c.	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c. Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 8

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

LONGER LASTING *lifting magnets* . . . built by Dings

Dings High Intensity Lifting Magnets last longer because of their rugged construction and the more than 40 years of experience back of their design. Every detail of construction has been improved to increase lifting power and structural strength: The coil spool is made of high permeability steel; there is a correctly proportioned balance of copper wire and steel to assure maximum lifting capacity with a minimum of weight and current input. Result: A powerful, longer lasting magnet . . . an ever growing list of enthusiastic users.

Dings builds a complete line of High Intensity lifting magnets in sizes from 18" to 65" diameter. Write today for Catalog No. 22.

Dings Magnetic Separator Co.
512 E. Smith St., Milwaukee 7, Wis.

DINGS FEATURES:

- Coil locked in place to prevent damage and short circuiting.
- Coil waterproofed—impregnated under pressure.
- Large structural fins give added strength and radiate heat.
- Leads fully protected.
- Heavy Rough bottom plate withstands rough handling.
- Special steels and highest quality construction.

☆

FOR INSPECTING CASTINGS

Alnico horseshoe magnet now being used with finely divided magnetic sprinklings to inspect castings for flaws. Very powerful. 2½" wide x 3" high. Pole bases ¾" x ¾".

Dings

"HIGH INTENSITY"

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb. unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per 100 lb. under base; primes, 25c. above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire. (15) Produced to dimensional tolerances in AISI Manual Sect. 6. For price exceptions to finished and semi-finished steels turn two pages.

Basing Point / Product	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	10 Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.25¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3.81¢	3.77¢
Long ternes [2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3.05¢	3.31¢	
TIN PLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
Electro, box 0.25 lb.	$4.35	$4.35	$4.35												
Electro, box 0.50 lb.	$4.50	$4.50	$4.50						$4.60						
Electro, box 0.75 lb.	$4.65		$4.65						$4.75						
BLACK PLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		(Duluth=2.35¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel [6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[12]	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢[12]	2.25¢		2.47¢
Cold finished [8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit=2.70¢)			(Toledo=2.80¢)		2.99¢	2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont=2.25¢)							
Carbon steel [15]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢	2.50¢		2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.50¢	3.50¢									3.85¢	4.15¢		3.86¢	3.82¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem=2.10¢)				2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester=3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright [14]	2.75¢	2.75¢		2.75¢	2.75¢		(Worcester=2.55¢)		(Duluth=2.80¢)			3.25¢			3.07¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (High Carbon)	3.35¢	3.35¢		3.35¢			(Worcester=3.45¢)					3.85¢			3.67¢
PILING															
Steel Sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton

Rerolling $36.00
Forging quality 42.00

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; East Michigan, $3.00 higher.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Open hearth or bessemer $36.00

PRICES

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.15c.
Worcester, Mass.	2.25c.
Birmingham	2.15c.
San Francisco	2.65c.
Galveston	2.40c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	44.00
	Base per Lb.
Cut spikes	3.25c.
Screw spikes	5.40c.
Tie plate, steel	2.30c.
Tie plates, Pacific Coast	2.45c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	Base per Keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	67	35
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	82
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

A CONVEYOR-COORDINATED PLANT that you can be proud of!

ARE you satisfied with your present production plant? Does material or goods in process flow smoothly with the least disorder, loss of time, waste of space or man-power?

If there is room for improvement, isn't it a matter of better coordination—better linking of all the steps involved from receiving — to shipping?

Whether your rate of manufacture is several hundreds a minute or one an hour, Standard builds conveying equipment to meet the situation.

The range and versatility of Standard Conveyor equipment are the result of nearly 40 years of close contact with inside-the-plant transportation — in plants large and small, making products as widely diverse as steel or cosmetics. The benefit of this experience is available to you, without obligations. The counsel of Standard Conveyor engineers is valuable in deciding on the right kind of conveying equipment to coordinate operations faster — for lower cost.

Write for comprehensive reference book —"Conveyors by Standard"— Catalog No. IA-65.

STANDARD CONVEYOR CO.

General Offices: North St. Paul 9, Minn.

Sales and Service in Principal Cities

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	$3.518	$4.872[6]	$5.158a	$3.822	$4.772	$3.605	$3.666	$3.822	$4.072	$5.966	$7.066	$7.272	$8.322
New York	3.59	4.613[3]	5.110	3.974[6]	4.772	3.768	3.758	3.853	4.103	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.185	4.965	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.69[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.93[17]	3.697	3.897	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.19	7.861	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.518	4.568	4.548	3.768	4.741	3.63	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	4.10	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.33[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	8.60[4]	5.75[4]	4.75[11]	....	4.85[11]	4.46[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[017]	....	6.17[13]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75¢	$15.00	$1.25	$25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
					NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70	14.00	1.20	24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00					
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	$1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9835	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	1.20	24.00	1.55	31.00
NE 9415	0.75	15.00	1.25	25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.55	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.27lc. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports)**

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

Steel (Butt Weld)

	Black	Galv.
⅛ in.	63½	51
¼ in.	66½	55
1 to 3 in.	68½	57½

Wrought Iron (Butt Weld)

⅛ in.	24	3½
¼ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Steel (Lap Weld)

2 in.	61	49½
2½ in. and 3 in.	64	52½
3½ to 6 in.	66	54½

Wrought Iron (Lap Weld)

2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17

Steel (Butt, extra strong, plain ends)

½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57

Wrought Iron (Same as Above)

½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Steel (Lap, extra strong, plain ends)

2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56

Wrought Iron (Same as Above)

2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.10
6 in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

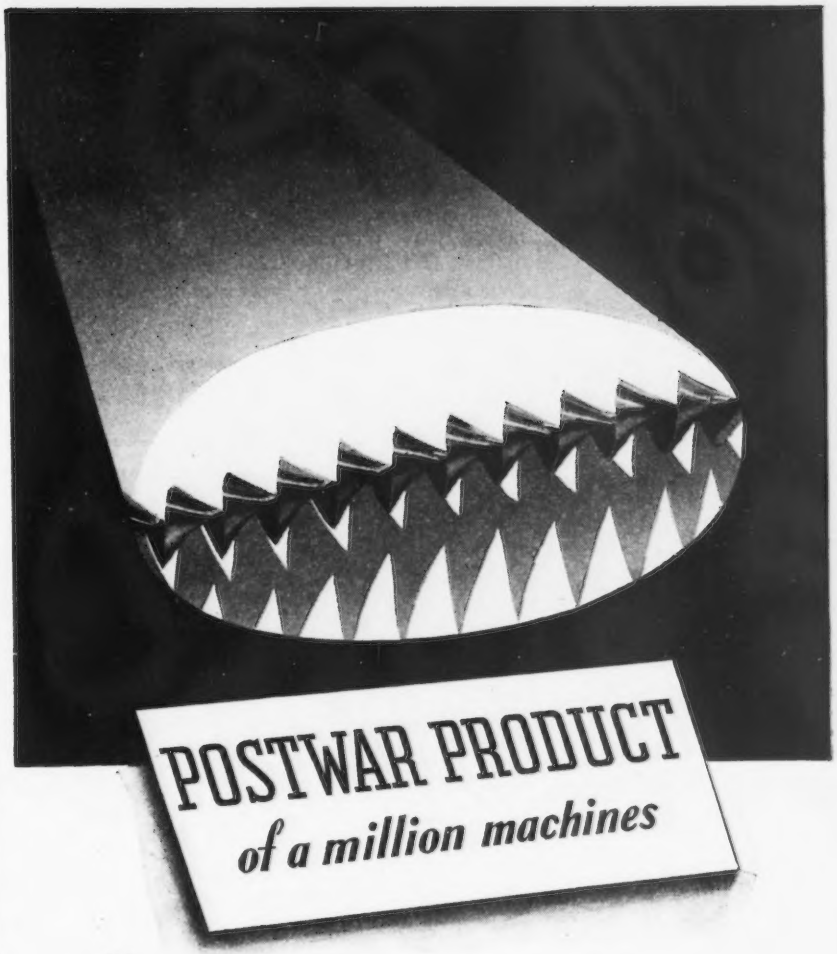
BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pitsburgh, in carload lots.

	Seamless Cold Drawn	Hot Rolled	Lap Weld, Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft. and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%



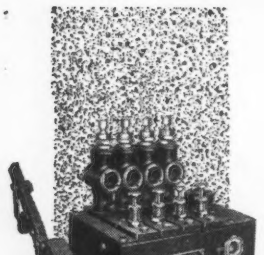
AFTER V-DAY, reconversion notwithstanding, thousands of metal-working factories will turn out the same products they made during and before the War. The products will be chips.

To the experienced eye, chips are valuable indicators of machining performance. Cutting fluids are a vital consideration in developing properly formed chips—not just to "cool" the tool and workpiece, but to prevent welding of metal to tool and to lubricate heavily loaded areas. So interrelated are the factors of metal-cutting operations that slight changes in the composition of cutting fluids alone can radically alter the shape and direction of chips.

Stuart men know how to make properly balanced cutting fluids—and how to apply them for top results. Through them, 80 years of experience is yours for the asking.

The 60-page Stuart booklet, "Cutting Fluids for Better Machining," contains interesting facts about chips and cutting fluids. Write D. A. Stuart Oil Co., Limited, 2737 So. Troy St., Chicago 23, Illinois.

D. A. Stuart Oil CO.
LIMITED
ESTABLISHED 1865
Stocks in Principal Metal-Working Centers



TORRINGTON
Force Feed Mechanical
LUBRICATOR

Positive, never-failing force-feed bearing lubrication. Design flexibility also enables power takeoff from machine to front, rear, side or bottom by ratchet or rotary means. For complete information write, stating number of feeds and drive desired.

THE TORRINGTON
MANUFACTURING CO., TORRINGTON, CONN.

HELPS TO GREATER ACCURACY *in Spring Coiling*

No. 16 Back Pitching

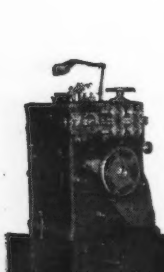
Back pitching is the term applied to a method of coiling an unusual amount of initial tension into an extension spring. Back pitching may also be used to coil *flat* rings.

1. For back pitching the pitch tool setup is the opposite of the standard for coiling open pitch springs. The back side of the pitch tool is used to do the work. The pitch tool lip is ground thin and sets *between* the first and second coils, as shown in the enlarged illustration at left above. The pressure on the wire is toward the back of the machine.

2. Cutting off must be done on the third coil. Caution must be used in setting up for back pitching, as too blunt a pitch tool will cause rings to deform and show what appears to be an inaccuracy in wire feed. A smooth coiling setup is necessary to produce a fine product.

3. Adjustment for proper amount of initial tension is easily made through the back pitching screw, which is the regular pitch screw moved to the alternate location shown in the illustration at right above.

There are limits to the minimum diameters with which back pitching is practical. In general, types of material and tempers control limits on the low side. Using hard-drawn spring wire the inside diameter of the coils should be approximately eight times the diameter of the wire. With oil tempered wires the limits are somewhat lower.



July 19 — Making Large Rings on a Standard Coiler

THE TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT

PRICES

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	$66.55
First quality, Pa., Md., Ky., Mo., Ill.	52.85
First quality, New Jersey	57.70
Sec. quality, Pa., Md., Ky., Mo., Ill.	47.95
Sec. quality, New Jersey	52.55
No. 1 Ohio	44.30
Ground fire clay, net ton	7.80

Silica Brick

Pennsylvania and Birmingham	$52.85
Chicago District	60.65
Silica cement, net ton (Eastern)	9.25

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

EXCEPTIONS TO RPS 6

Ingots, carbon, rerolling—Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10.

Ingots, carbon, forging—Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, alloy—C/1 delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Slabs, per gross ton—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co., (rerolling) $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64 (shell steel) $74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tinplate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

PRICES

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co. $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron, $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.65c. mill; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.33c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.ob Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel, Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.33c. mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass., f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel, 2.25c. Parkersburg.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.85c. Parkersburg; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

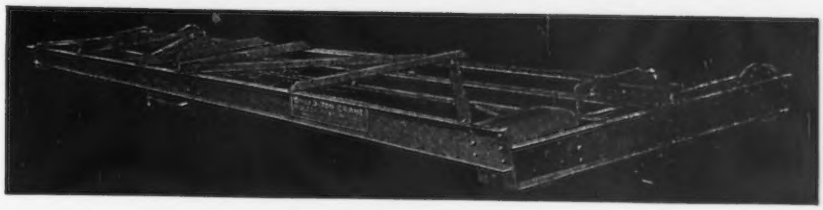
Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.85c.; pot annealed wire, 2.85c.; galvanized barbed wire, 3.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c.

CONCO 3-Motor Single Girder CAB OR FLOOR OPERATED

ELECTRIC CRANE . . .



● Available in capacities of one through five tons for floor or cab operation. Simply, ruggedly designed for low first cost and maintenance. Used with Low Headroom Type Hoist, provides for maximum space coverage horizontally and vertically. Effective in even a minimum space. Write for Bulletin 2000.

Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities 250 lb. — $139.50, 500 lb. — $149.50, 1000 lb.—$159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.

CONCO ENGINEERING WORKS

Div. of H. D. Conkey & Co. — 15 Grove St. — Mendota, Ill.

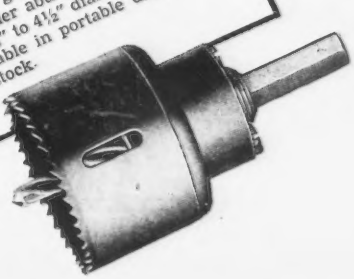
Builders Of Conco Torpedo Electric Hoist

Fast Tough

Heavy feed at high speed spells doom to the ordinary hack saw blade; down-time for your machine, extra expense in money, man hours, and production. The MARVEL Hack Saw Blade, because it is positively *unbreakable* under these conditions, should be "a must" tool in every efficiently operated shop. A tough alloy steel back is electrically welded to high speed steel teeth, producing a blade that can be pulled to almost unlimited tension; can withstand extra heavy feeds and the heat and abrasion of high speed heavy duty sawing.

The same exclusive *unbreakable* feature of MARVEL Hack Saw Blades is also a feature of MARVEL Hole Saws, giving these saws the ability to stand up under abuse. MARVEL Hole Saws cut holes from ⅝" to 4½" diameter in stock up to 1⅛" thick. Usable in portable drill, drill press, or lathe tail stock.

Heavy feed at high speed!



HIGH-SPEED-EDGE MARVEL ARMSTRONG-BLUM MFG. Co. CHICAGO U.S.A.

Complete Range of Metal Sawing Machines

Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course)

ARMSTRONG-BLUM MFG. CO.

5700 W. Bloomingdale Ave., Chicago 39, Illinois, U.S.A.

BASING POINT* BASE PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$25.50	$26.00	$26.50	$27.00	
Birdsboro	25.50	26.00	26.50	27.00	$30.50
Birmingham	20.00	21.38		26.00	
Buffalo	24.00	25.00	25.50	26.00	30.50
Chicago	24.50	25.00	25.00	25.50	..
Cleveland	24.50	25.00	25.00	25.50	.....
Detroit	24.50	25.00	25.00	25.50	.....
Duluth	25.00	25.50	25.50	26.00	.....
Erie	24.50	25.00	25.50	26.00	.....
Everett	25.50	26.00	26.50	27.00	.....
Granite City	24.50	25.00	25.00	25.50	.....
Hamilton	24.50	25.00	25.00		.....
Neville Island	24.50	25.00	25.00	25.50	.....
Provo	22.50	23.00			.....
Sharpsville[1]	24.50	25.00	25.00	25.50	.....
Sparrows Point	25.50	26.00	...	...	30.50
Steelton	25.50	...	...	...	
Swedeland	25.50	26.00	26.50	27.00	...
Toledo	24.50	25.00	25.00	25.50	.....
Youngstown	24.50	25.00	25.00	25.50	.....

DELIVERED PRICES† (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$ .50	$26.00	$26.50	$27.00	$27.50	
Boston	Birdsboro-Steelton	4.02					$34.52
Brooklyn	Bethlehem	2.50	28.00	28.50	29.00	29.50	
Brooklyn	Birdsboro	2.92					33.42
Canton	Cleveland	1.39	25.89	26.39	26.39	26.89	
Canton	Buffalo	3.19					33.69
Cincinnati	Birmingham	4.06	24.06	25.44			
Cincinnati	Hamilton	1.11	....		26.11		
Cincinnati	Buffalo	4.40					34.90
Jersey City	Bethlehem	1.53	27.03	27.53	28.03	28.53	
Jersey City	Birdsboro	1.94					32.44
Los Angeles	Provo	4.95	27.45	27.95			
Los Angeles	Buffalo	15.41					45.91
Mansfield	Cleveland & Toledo	1.94	26.44	26.94	26.94	27.44	
Mansfield	Buffalo	3.36					33.88
Philadelphia	Swedeland	.84	26.34	26.84	27.34	27.84	
Philadelphia	Birdsboro	1.24					31.74
San Francisco	Provo	4.95	27.45	27.95	....	....	
San Francisco	Buffalo	15.41			....	....	45.91
Seattle	Provo	4.95	27.45	27.95	....	....	
Seattle	Buffalo	15.41			....	....	45.91
St. Louis	Granite City	.50	25.00	25.50	25.50	26.00	
St. Louis	Buffalo	7.07	....	....	....	....	37.57

* Maximum per gross ton, established by OPA February 14, 1945. † Prices do not reflect 3 per cent tax on freight.

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10, April 11, 1945, retroactive to March 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 per cent silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 per cent, C/L per G.T., f.o.b. Jackon, Ohio—$30.50; f.o.b. Buffalo—$31.75. Add $1.00 per ton for each additional 0.50% Si. Add 50c. per ton for each 0.50% Mn over 1.00%. Add $1.00 per ton for 0.75% or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21½ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh 96 + % Fe	12½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh	8½c. plus metal
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

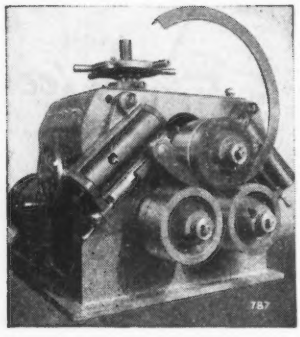
*Hand drawn ovens using trucked coal permitted to charge $8.00 per ton plus transportation charges.

SPECIAL MACHINERY BUILT ON CONTRACT

BENDING AND STRAIGHTENING MACHINES

PUNCHING AND SHEARING MACHINERY

THOMAS Bending ROLLS



. . for angles, tees, flats, channels, squares, etc.

THOMAS BENDING ROLLS are available in horizontal or vertical types and a variety of sizes. Correctly designed and sturdily built, these machines will render many years of fast, accurate service at a minimum of operating and maintenance expense.

Our bulletin No. 314 gives complete details. Write 6

THOMAS MACHINE MANUFACTURING COMPANY

PITTSBURGH, PA.

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
3/16 & ⅝ in. x 6 in. & shorter	63½
½ in. & smaller x 6 in. & shorter	65½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	**U.S.S.**	**S.A.E.**
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 85c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

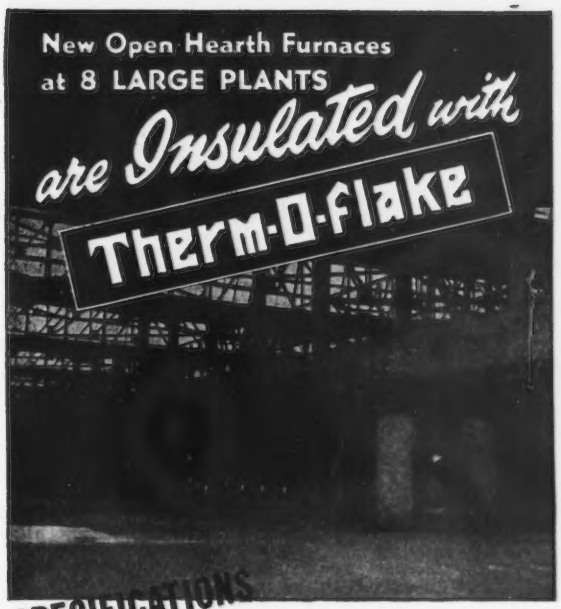
	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.30c.
Armature	3.65c.
Electrical	4.15c.
Motor	5.05c.
Dynamo	5.75c.
Transformer 72	6.25c.
Transformer 65	7.25c.
Transformer 58	7.75c.
Transformer 52	8.55c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.



SPECIFICATIONS for Greater Fuel Economy Improved Working Conditions

Therm-O-Flake Casting Vertical walls — bulkheads — roofs — arches.

Therm-O-Flake Brick Flue Walls and Arch — Checker Chamber Walls. Slag Pocket Walls.

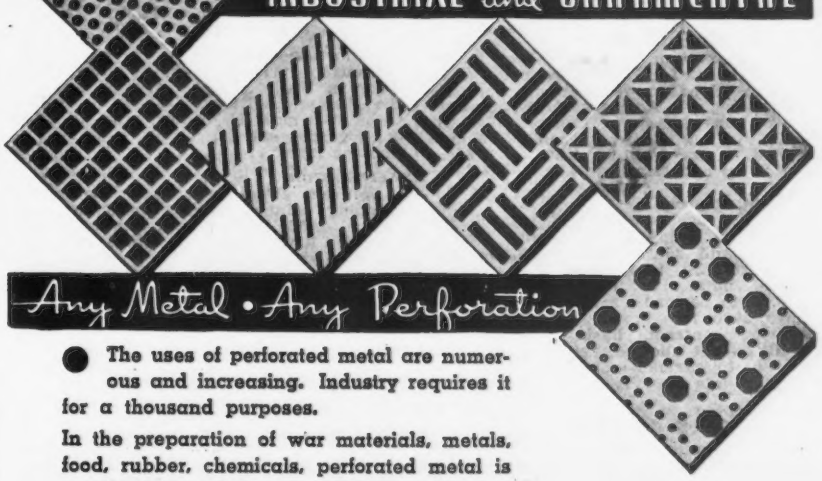
Therm-O-Flake Concrete Flue — Checker Chamber Hearth Bottoms.

Illinois Clay Products Company
JOLIET, ILL.

High Temperature
INSULATION

PERFORATED METAL

INDUSTRIAL and ORNAMENTAL



Any Metal • Any Perforation

● The uses of perforated metal are numerous and increasing. Industry requires it for a thousand purposes.

In the preparation of war materials, metals, food, rubber, chemicals, perforated metal is required to perform an important role.

The Harrington & King PERFORATING Co.

5657 FILLMORE STREET—CHICAGO 44, ILL.
Eastern Office, 114 Liberty Street, New York 6, N. Y.

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.
Carload lots (bulk) $135.00
Carload lots (packed) 141.00
Less ton lots (packed) 148.50
$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.
96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.
Carload, bulk ..... 36c.
L.c.l. lots ..... 38c.
95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.
Carload, bulk ..... 34c.
L.c.l. lots ..... 35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.
Carload, bulk ..... 6.05c.
2000 lb. to carload ..... 6.70c.
Under 2000 lb. ..... 6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb. .... 5.80c.
2000 lb. to carload ..... 6.30c.
Less ton lots ..... 6.55c.

Ferrochrome

(65-72% Cr. 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c	14.50c.

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Bulk	Ton Lots	Less Ton
0.10% max. C, 1 or 2% max. Si	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.
16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.
Shot or ingot ..... 45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.
75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.
15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa. York, Pa., per lb. contained tungsten, 10,000 lb. or more.... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.
Open hearth $2.70
Crucible $2.80
Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5..... $1.10

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
Carload lots ..... 25c.
2000 lb. to carload..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
Carload lots ..... 58c.
2000 lb. to carload..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
No. 1 ..... 87.5c.
No. 6 ..... 60c.
No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
Ton lots, per lb..... 45c.
Less ton lots, per lb..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
2000 lb. lots $2.25
Under 2000 lb. lots..... $2.30

Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
Less ton lots..... $1.25

Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium $1.35
Less ton lots..... $1.40

High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload..... $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton..... 58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquets, 48-52% Mo. f.ob. Langeloth, Pa. per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b Langeloth and Washington, Pa. per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy
Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
Car lots ..... 8.00c.
Ton lots ..... 8.75c.
Less ton lots ..... 9.25c.